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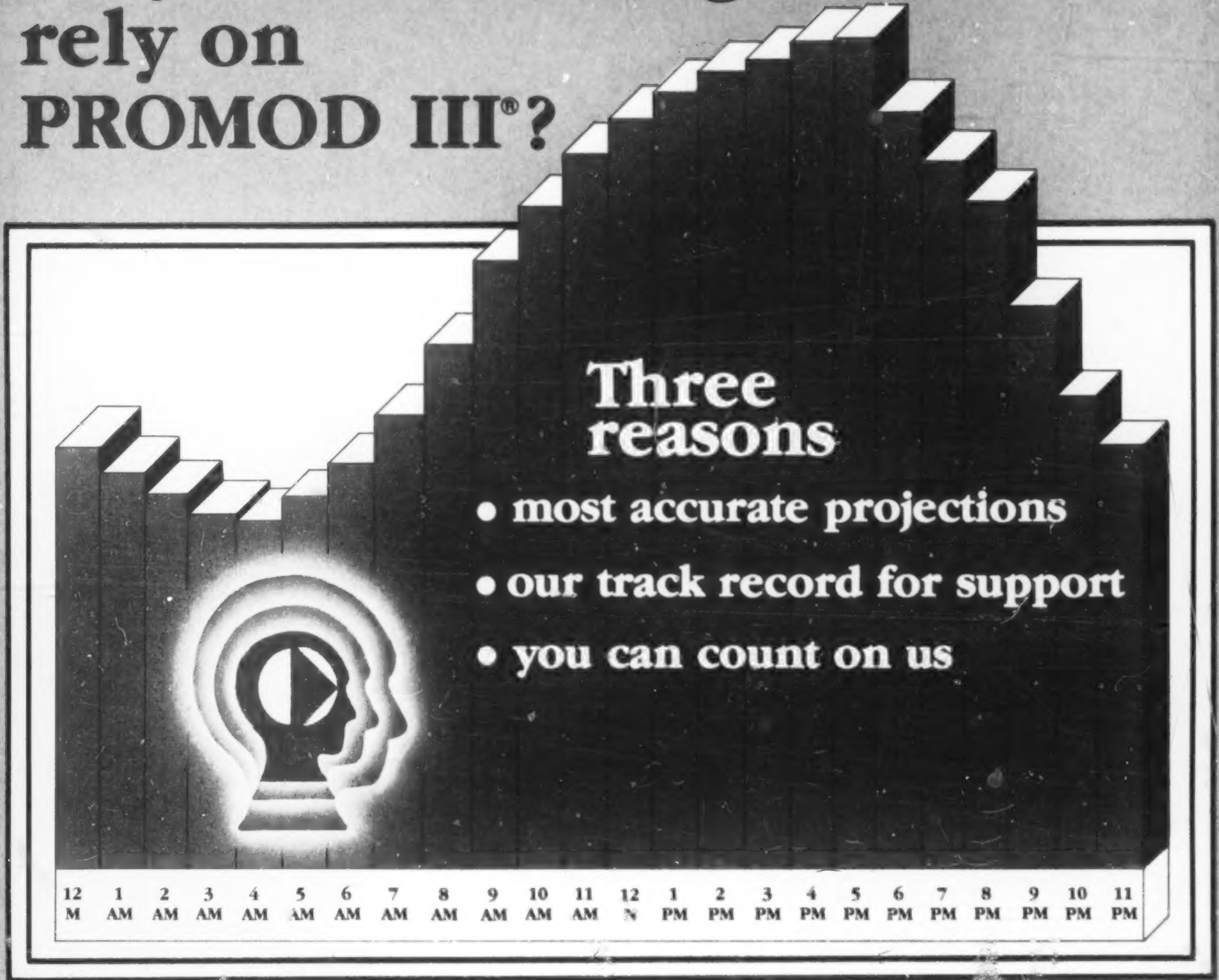

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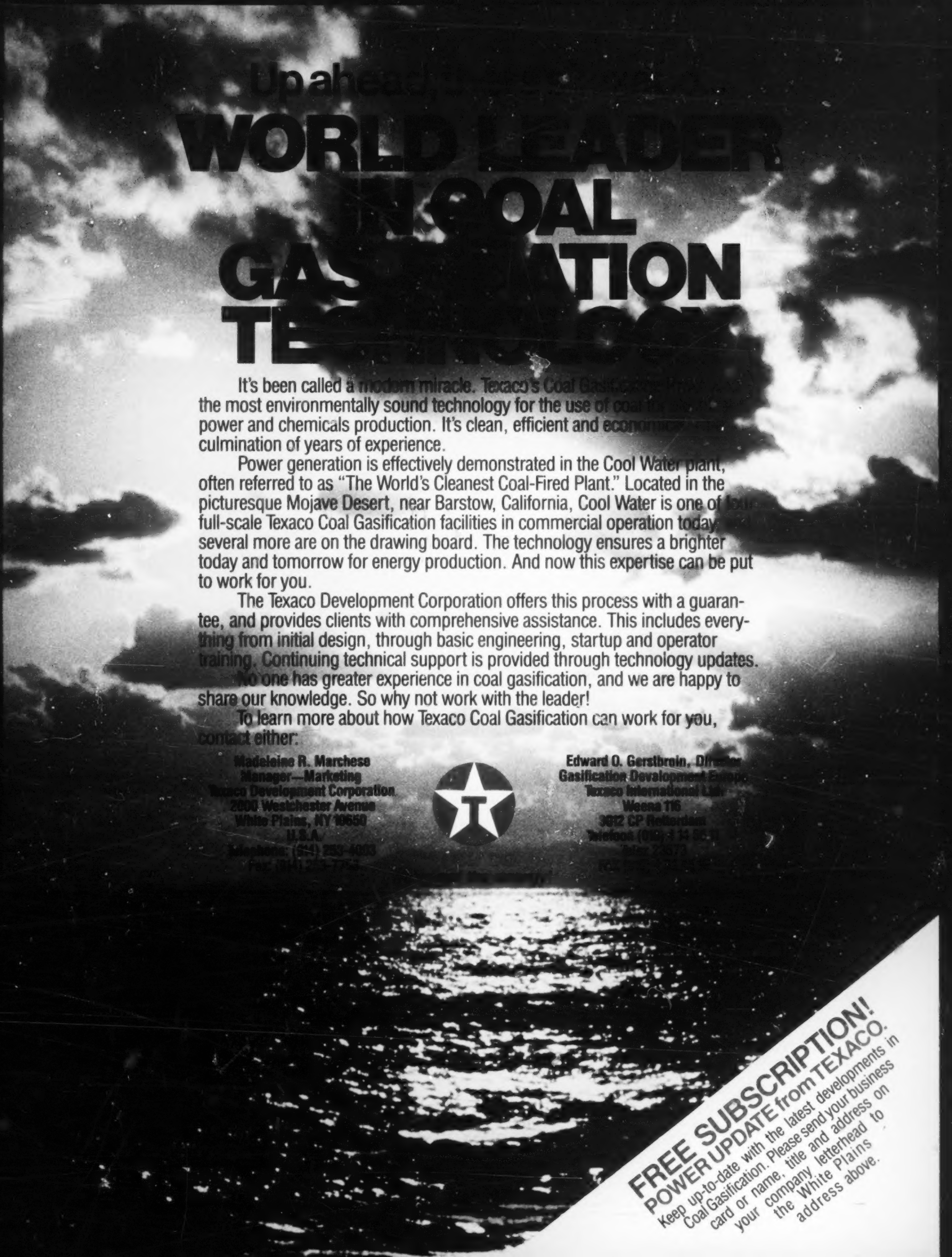

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CONTENTS

ELECTRIC PERSPECTIVES EP **WINTER 1988**

UTILITY MARKETING GROWS UP 8

Once little more than a generic term for sales activities, utility marketing has emerged as a real—and crucial—discipline.

By Thomas D. Morron

THE VALUE OF COSA 14

Marginal cost-of-service analysis offers utilities a powerful and straight-forward way to assess demand-side programs.

By Eric Hirst

COGENERATION: COMPETITION OR RESOURCE? 26

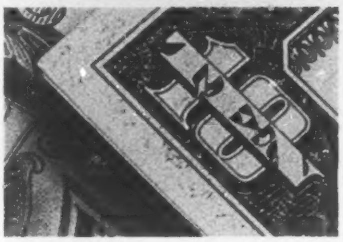
The answer depends in large part on how well utilities listen to their customers.

By Joel S. Gilbert

DIVERSIFICATION AND THRIFTS 34

Some electric utilities are finding that savings and loans offer them an attractive investment opportunity.

By Eric Luse



REVIEWS

TECHNOLOGY REVIEW 40

REGULATORY REVIEW 42

FINANCIAL REVIEW 43

STATISTICAL REVIEW 47

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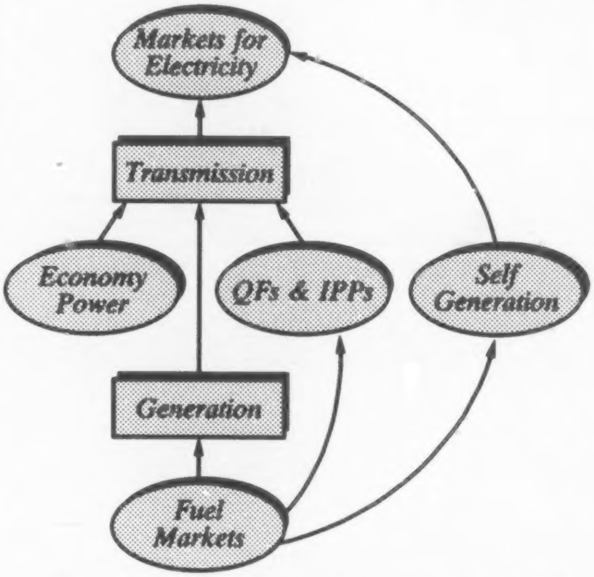
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Thomas D. Morron

Utility Marketing Grows Up

Once little more than a generic term for sales activities, utility marketing has emerged as a real—and crucial—discipline.

When the word "marketing" is used in a discussion of electric utility operations, an almost immediate mental reaction occurs. It makes no difference whether the participants in the discussion are utility managers, consumer advocates, regulators, legislators, or customers. The word is immediately equated with activities designed to sell more power.

In part, at least, this reaction is based in the industry's history. From Pearl Street Station through to the late 1960s and early 1970s, the electric utility industry took maximum advantage of its declining incremental costs by aggressively promoting its product at every opportunity. This promotion contributed not only to the significant reductions in electric rates but also to the dramatic improvements in the quality of American life experienced during these years.

When the industry was stunned by the dual blows of an overnight reversal of traditional economies of scale and an oil market suddenly become a nightmare, what was called marketing all but disappeared from the organizational charts and lexicons of utilities. Marketing—read selling—was no longer appropriate for any number of very good reasons.

With internal generation of cash at historic lows and construction and financing costs reaching historic highs, those companies which approached the marketplace at all did so with a full range of conservation and load management programs and offerings. Controlling the growth of demand to avoid having to build anything more was clearly the order of the day.

In this introductory essay, Tom Morron, Vice President of Customer Services & Marketing at Edison Electric Institute, describes the evolution of the marketing function within the electric utility industry and points to the marketing challenges that yet remain. The essay will be followed next year by a series of articles on those marketing challenges and how they are being met.

Interestingly enough, the marketplace itself probably did more to lower growth rates than any of the legislation, regulation, or utility marketing of the day. The same external events that had thrown the utilities for a financial loop were busily at work throwing the country for a loop. Double digit inflation, decreasing export trade, increasing foreign competition, and a host of other factors produced a crippling recession. In turn, growth in demand for electricity fell sharply from what had been forecast. As utility luck would have it, all this culminated at the tail end of a massive construction program that left most of the industry with a bit more capacity than was comfortable.

During this less than idyllic interlude, sales and marketing titles disappeared and were replaced by a wide variety of titles reflecting the new focus on conservation and energy management. It was here that the former marketing experts began to realize that what they had been doing was not really marketing—it was selling. In order to achieve objectives calling for peak demand reduction, load factor improvement, and capital conservation, tools had to be developed to examine customer needs, wants, and consumption patterns in ways that would isolate opportunities to alter their energy behavior, produce results beneficial to both company and customer, and minimize costs. It was at this point that utility marketeers began to learn the lessons their counterparts in the manufacturing and service sectors had, with similar pain, been learning.

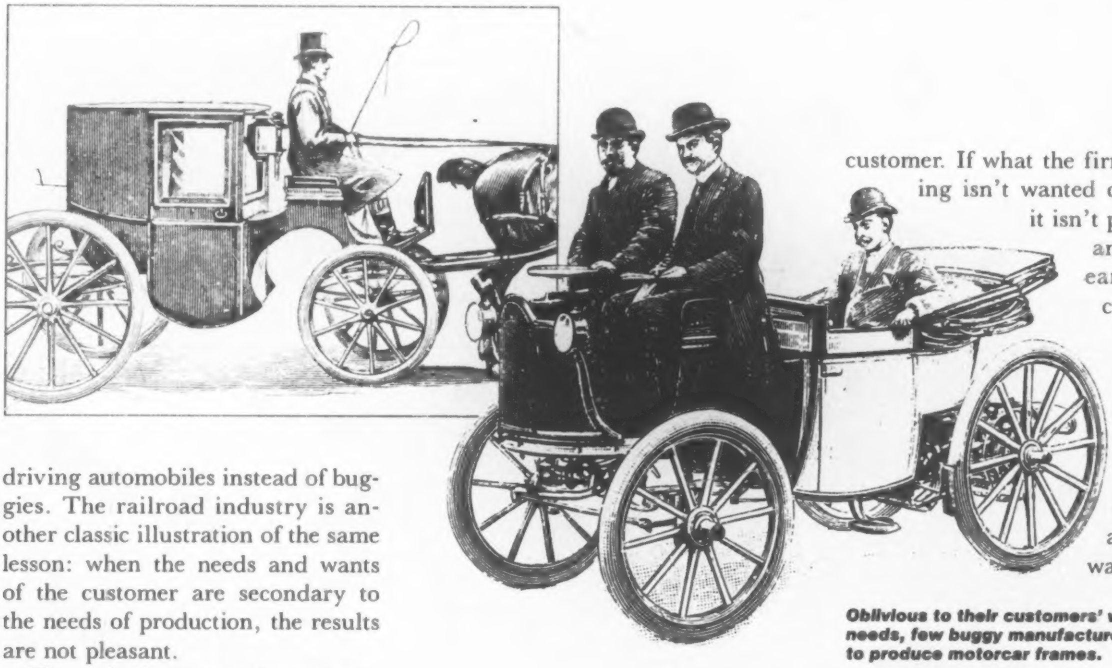
Selling Buggy Whips

For years all industries had generally accepted the notion that the function of marketing was to take a product, find ways to sell and promote it, and thereby produce profit through sales volume. As Philip Kotler explains in *Marketing Management: Analysis, Planning and Control*, this view held that ". . . the activities known as marketing begin with a set of goods and end with their sale." The focus was on product. The selling of that product in volume took maximum advantage of productive capacity and produced profits.

It was this traditional view of marketing, however, that gave rise to the now-famous business school and popular press example of the buggy whip industry. It doesn't matter if you can produce a better buggy whip than ever before at a lower cost than ever before if more and more of your customers are

Mitch Kezar / Uniphoto

Today's marketing meetings are not just for the sales staff: the best marketing strategies reflect the wisdom and involvement of managers from throughout the utility.



Oblivious to their customers' wants and needs, few buggy manufacturers retooled to produce motorcar frames.

driving automobiles instead of buggies. The railroad industry is another classic illustration of the same lesson: when the needs and wants of the customer are secondary to the needs of production, the results are not pleasant.

Through these experiences non-utility marketeers learned that their organizations could gain more by being driven by the market than by the forces of production. In short, there was more profit in the production of customer satisfaction than there was in production alone. Find out what the customer wanted or needed first, then produce it. This non-utility marketing role reversal produced a much more sophisticated approach to the marketplace, one which focused outward rather than inward.

Utility marketeers and their managements began to learn this same lesson in the early 1970s. The shift away from sales promotion strategies and toward conservation produced an almost immediate awareness that time-honored methods were not up to the task. In past years, well-planned advertising campaigns had produced results. Promotional campaigns with trade allies had produced the desired outcome. Why did these same tools not produce the same results for conservation as they did for sales?

A great deal of time and treasure was spent in seeking the answer to this question. Studies were done, consultants were hired, advertising agencies were changed, and executive desks were pounded. Appeals were made to altruism, patriotism, truth, justice, and the American way, but still no results. Why not? Why did utility load profiles not change the way the computers said they should? Why didn't customers do what they were told? The answer was disarmingly simple once discovered, and this discovery prompted substantive changes in the way utilities view marketing. When all else failed, the customer was at last consulted and said simply, "I don't want to."

Understanding the Customer

Conservation, it turned out, conjured up images of hair shirts, deprivation, and reduced quality of life in the minds of customers. In focusing on the need to match loads to resources, the customers' needs, wants, and perceptions were dropped from the equation. The results, as any former buggy whip tycoon will attest, were easily predictable. The utility customer, it seems, has much the same characteristics as the former buggy whip customer. If what the firm is offering isn't wanted or needed, it isn't purchased, and in the early 1970s, customers weren't buying conservation. Thus began an operational shift away from the

traditional view of marketing to a new approach that emphasized an outward focus on the customer.

Although the very term "marketing" still guaranteed a steep and immediate rise in regulatory blood pressure, the middle and late 1970s saw utilities doing just that, marketing. Granted, the journey was not without mishap, but utilities learned quickly from these missteps. It was discovered that not all customers in a given class of service were identical. Plans and programs were then developed to fit the needs of particular market segments. The "win-win" standard was adopted. While the economy had its effect on the growth in demand, these programs had a further effect and produced literally billions of dollars in savings for utility companies and their customers. As the industry entered the decade of the 1980s, a good many companies actually had marketing on the organizational chart. This time it was real marketing, and none too soon.

With the advent of capacity surpluses brought about by the completion of new power plants, with regulators hacking away at the ratebase under the guise of prudence reviews, with independent power producers, cogenerators, and self-generators sprouting up everywhere, and with a well-heeled and revitalized gas industry competing at every turn, the way to financial health for electric utilities depends in large measure on their marketing ability. A return to a "Let's sell the hell out of it!" posture might sound like a reasonable idea but has several serious flaws. While such a posture might produce the desired increase in revenue, it may well put the company behind the construction eight ball again. In any case, such a posture just won't work with today's customers.

Just as the customer of the 1970s would not conserve a kilowatt or kilowatt hour just because the utility asked him, neither will the customer of today or tomorrow buy a kilowatt or a kilowatt hour just because the utility asks it. Customers' buying decisions in the energy marketplace, whether residential, commercial, or industrial, are based on a selection from many more options and much more stringent economic analyses. All of this simply means that utility departments such as rates, systems planning, engineering, operations, finance, and customer service must involve themselves fully in the marketing process if customers are to be satisfied profitably and corporate objectives met successfully. In short, while the industry has learned much, much remains to be done to sharpen our focus on the customer.

What Next?

It is often noted that nothing is more certain than uncertainty. The utility industry faces a new decade from very nearly the bottom of a well of uncertainty. On the supply side of the equation, new construc-

Jon Feingersh / Uniphoto

Aggressive, well-financed marketing—from appliance R&D to sales promotions—has helped the gas industry gain market share. Here a service rep installs high-efficiency gas water heaters.

Looking beyond the meter, the Japanese developed automatic bread bakers to turn customers' "I don't want to" into increased off-peak sales.

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tion presents greater risk than ever before, and yet new facilities will have to be built if only to replace aging equipment. On the demand side of the equation, the industry is losing market share. Figures compiled by the Commerce Department show that the electric utility industry has lost control of the residential market in both single- and multi-family new construction for the first time in over 15 years. The American Gas Association's 1987 Commercial Gas Market Survey shows that electricity-to-gas conversions were up 357 percent.

All of these factors and many others absolutely dictate increasingly sophisticated marketing. If the increasingly diverse needs of customers are to be met expeditiously, if the supply/demand equation is to be kept in balance, if regulatory expectations are to be met, if legitimate environmental concerns are to be addressed, and if the industry is to survive, then real marketing must take place.

Painful lessons have been learned and paid for as the result of viewing marketing as synonymous with sales. The decade of the 1990s will require less intuitive decision-making and much, much more customer-focused, fully integrated planning than ever before. The utility marketing effort must build on a base of high energy efficiency, using load and energy management techniques both to minimize the need for new investment and to maximize the use of existing investment. From that base, utilities must offer customers a full and complete range of service options that are very clearly targeted to meet the particular needs of narrowly focused market segments.

A story I heard at a conference of utility experts in Japan a bit over one year ago epitomizes the kind of marketing that will succeed here equally well. (And it will fulfill the almost mandatory requirement that any article written today about marketing or customer service, regardless of industry, contain an example of what we can learn from the Japanese.) It seems that the Japanese utilities were looking for ways to improve residential load factor by encouraging off-peak use. Time-of-use rates were offered to provide financial inducement, but Japanese residential customers were more than customarily reserved in their response.

While the exact details were not related, it seems reasonable to assume that after at least a certain amount of Japanese executive desk pounding, a new approach to encouraging off-peak use was developed. The Japanese utilities discovered that something on the order of 90 percent of the bread consumed by their residential customers was baked in the home using fuels other than electricity. The response was the development of a machine which met both customer and corporate objectives. It required only that the customer put the necessary ingredients in the machine and set a timer before retiring. The machine mixed and kneeded the dough, formed it into a loaf, and baked it overnight unattended. The result was a classic "win-win" situation. The customer got freshly baked bread in the morning with very little effort. The utility got increased off-peak use.

The machines are now selling at a clip astonishing even to the Japanese.

It is clear in this example that simply being the "low-cost producer" was not enough. Just as American utilities discovered in an earlier decade, when the customer says "I don't want to," another approach must be found. The Japanese looked well beyond the meter and found a way to add value to their low-cost product. The choice they offered to the customer was not commodity-based but value-based.

Product And Service

As we all know, a kilowatt hour is, by definition, a kilowatt hour. Product differentiation, traditional theory holds, is only possible, therefore, through price. The natural temptation is to structure the utility to produce the lower cost kilowatt hour. While this continues to be an absolute must for the utility industry, in this new era of more demanding and sophisticated customers, trying to compete solely on cost is, at best, only a short-term strategy. (Ask a buggy whip salesman.)

A considerable amount of study in other industries conducted by the Strategic Planning Institute of the Harvard Business School concludes that long-term profitability is much more frequently achieved by those organizations which, while not ignoring price, choose to differentiate themselves on the basis of a quality or service dimension. Lest the depth of this research be underestimated, it should be noted that SPI's database, which has been in place since 1972, comprises some 450 companies and 3,000 business units.

Unfortunately, this massive database does not include electric utilities. Nevertheless, important lessons learned from these evaluations can be applied to our industry. Not the least of these is that purchasing decisions are not ordinarily made on price alone. A look into our own purchasing departments will reveal that factors such as service, product quality, and reliability frequently override the low-cost bid.

Not surprisingly, our customers feel the same way. Research conducted for EEI by Cambridge Reports, Inc., over the last five years very clearly shows that our customers view us not only as suppliers of a product but also as providers of a service and that their positive perceptions of our service can actually offset their negative perceptions of our product and its price. Ignoring this perception on the part of our customers in favor of a single-minded concentration on price may well be rewarding in the short run but lethal over the long haul. Let's face it. The possibility does exist that somebody out there somewhere just might be able to beat our price. However, nobody is better positioned than we to provide top value and service. Taking maximum advantage of this positioning while maintaining the lowest possible cost must be the focus of our marketing efforts as we move into the 1990s and beyond. **EP**

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Eric Hirst

The Value of COSA

Marginal cost-of-service analysis offers utilities a powerful and straightforward way to assess demand-side programs.

To respond effectively to the challenges of competition, electric utilities must continuously strive to learn more about their customers and their own operations. Cost-of-service analysis, or COSA, can help them to that end. Traditionally conducted primarily for rate cases, it is a useful technique for determining the profitability of serving different market segments. COSA results, coupled with data on customer preferences and load shapes, can be used to help design programs that enhance customer service and increase net revenue to the utility.

The process of conducting a COSA and interpreting its results is straightforward and easy to understand. It does, however, require, and thus encourage, cooperation and communication among various departments within a utility.

This article demonstrates these largely untapped benefits of a marginal cost-of-service analysis.[1] Results are presented from a hypothetical study that analyzes the marginal costs of providing incremental services to a particular utility's customers. Marginal cost refers to the utility's cost of providing its customers with additional units of service; these units are measured in kilowatt-hours (kWh) of energy, kilowatts (kW) of demand, and customer-related activities (meter reading, billing, etc.). Although the "data" are roughly representative of utilities in the Pacific Northwest, the insights gained from the exercise should be relevant to utilities nationwide.

COSA History

Electric utilities have conducted embedded and marginal cost-of-service analyses for many years. Embedded costs refer to the costs associated with existing plant and equipment and current operations. Analyses of these historical costs are useful for traditional rate-of-return regulation where the primary emphasis is on allocating existing capital and operating costs among customers.

Marginal costs refer to future increments in service; that is, they are based on plans for future capital investments and operations. The original purpose of COSA was to identify costs associated with serving different groups of customers so electric rates could be designed to be equitable and nondiscriminatory.[2] However, because rate-case decisions are based on politics, tradition, and practical considerations as well as on economic analysis, actual rate design often differs from the ideal defined by COSA. In addition, the administrative and technical burdens of precise cost assignment are often sufficiently high to prevent rates from accurately reflecting costs.

Still, because of their focus on prospective decisions and associated costs, marginal cost analyses are especially useful in planning. For example, they form the basis of the "avoided cost" used in many instances to determine how much a utility should pay for power generated by a non-utility facility. This avoided cost also serves as an important benchmark in planning for future power plants and demand-side programs because it establishes the upper limit for the cost of these alternative resources. In addition, some utilities and public utility commissions use marginal costs as a guide to rate design to help provide economically correct price signals to customers.

Conducting a COSA

The objective of a marginal cost-of-service analysis is to identify the costs to the utility of providing incremental services to both new and existing customers. Exactly how to do so is spelled out elsewhere, but a brief summary of the steps involved is useful here.[3]

First, various departments within the utility must agree on key planning assumptions—inflation rate, time horizon for the study, load growth forecast, resource acquisition plan, etc. Next they must collect data and develop forecasts to estimate the future costs associated with operations and maintenance, depreciation and amortization, federal and other taxes, ratebase, and operating income. These costs are intended to reflect the future operating and planning characteristics of the utility (i.e., how and when the utility will construct facilities and will operate its system).

In a process called functionalization, the detailed costs are then assigned to specific utility activities: production, transmission, distribution, and customer service. Each of

Eric Hirst is a Corporate Fellow in the Energy Division of Oak Ridge National Laboratory.

M. Mackenzie / Uniphoto

COSA can tell a utility, for example, how much (if any) it can spend to promote the construction of all-electric homes.

these plant and expense costs is then classified according to the services that customers receive: energy, demand, and customer components. The classification of a particular cost is based on the reason(s) for that activity: to meet peak demand, to provide energy, to physically connect customers to the system, or to bill customers. Finally, in a process called allocation, costs are assigned to each customer class/rate schedule. The end result of this process is a detailed breakdown showing how different utility activities contribute to provision of energy services by market segment. (See schematic below.)

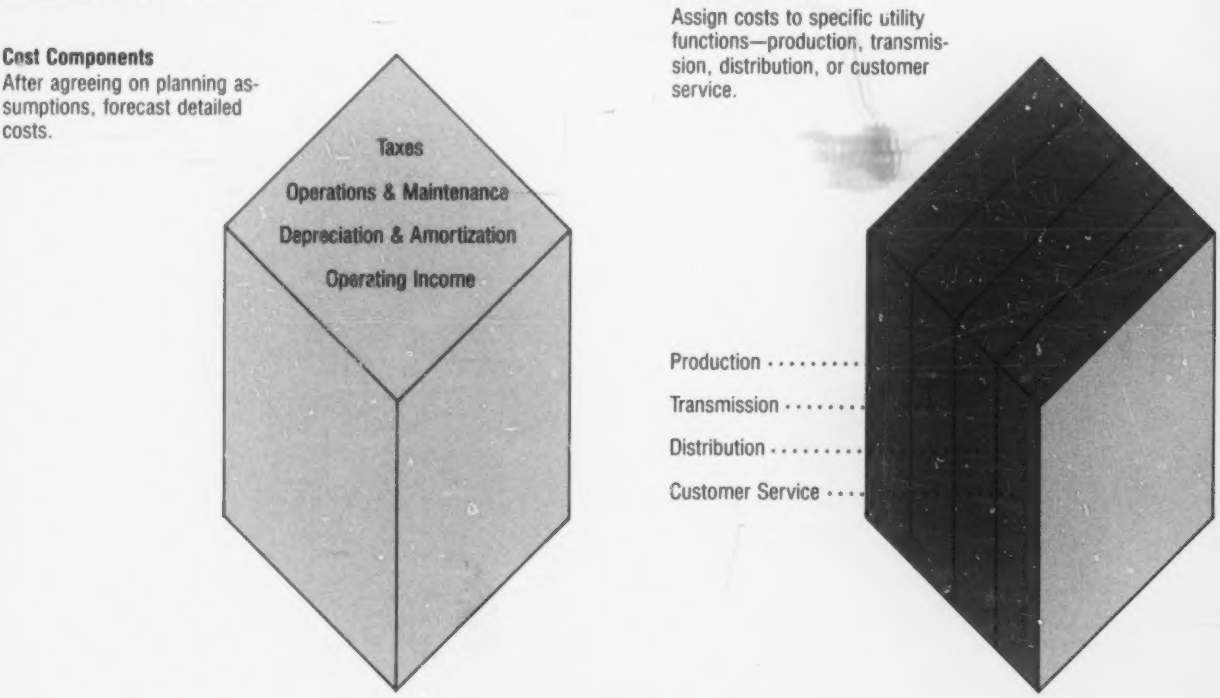
Assumptions made in the COSA can have large effects on the estimated costs across rate schedules. Therefore, it is important to note that functionalization, classification, and allocation are subject to substantial uncertainty and therefore require considerable judgment. For example, there is no unique or unambiguous method for classification of the costs of a power plant between energy and demand. Similarly, it is often unclear whether transmission costs should be classified in exactly the same way that production facilities are.

Because so much judgment is involved in these studies, careful review of COSA results by staff in different departments is essential. Data and judgment are generally needed from the financial planning, accounting, tax, transmission & distribution planning, power planning, rates, customer programs, load research, and market research departments. As a result of this interaction, information and ideas from disparate departments get organized, reviewed by others, and integrated. More importantly, common assumptions about planning and operations become accepted throughout the utility. Of course, the price that must be paid for this improved communication, cooperation, and consensus is the frequent iteration of the COSA assumptions and calculations. The final product, however, is likely to be widely accepted within the company.

The COSA Findings

The end result of a marginal COSA is a matrix showing costs by function for each rate schedule; results obtained with this hypothetical ex-

Marginal COSA Schematic

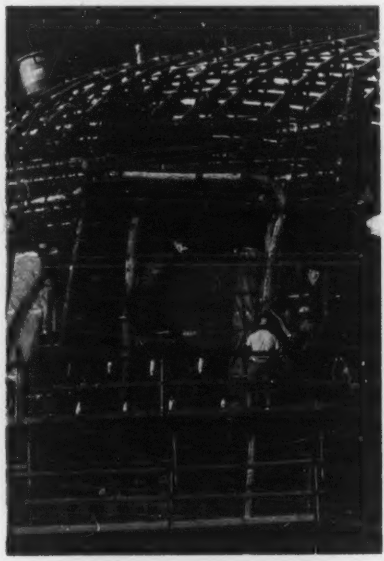


Cost Components
After agreeing on planning assumptions, forecast detailed costs.

Functionalization
Assign costs to specific utility functions—production, transmission, distribution, or customer service.

ercise are shown in Table 1. In the present exercise, the real (adjusted for inflation) marginal costs of transmission, distribution, and customer services are assumed constant over time. Only production costs are assumed to change. (See Figure 1.)

The patterns of energy and demand costs associated with incremental production developed for this study are based on a three-part sequence: (1) short-term power purchases until 1991, (2) long-term purchases from 1991 through 2000, and (3) construction of a coal plant that comes online in 2000. Between 1987 and 2000, incremental needs for electricity are met by purchasing power from other utilities. Short-term contracts (three to five years) are used until 1991 because the regional power surplus is assumed to continue until the mid-1990s, yielding low prices for such contracts. This hypothetical utility switches to long-term contracts (10 to 20 years) in 1991 because it believes that the cost of purchasing power will increase rapidly as the regional surplus disappears. The utility plans to build its own coal plant during the late 1990s because it believes that cheaper sources of power will not be available.


John Zoner / Uniphoto

Production costs are assumed to flatten in the year 2000 when the utility brings a new plant online.

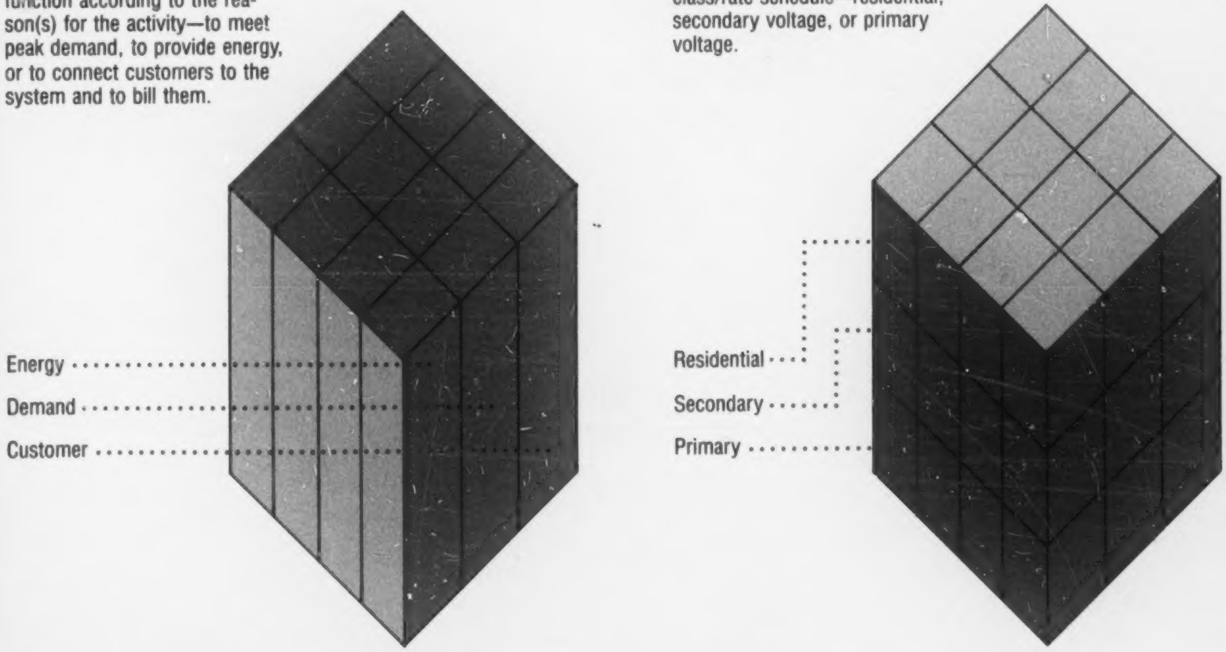
Production and transmission costs differ across rate schedules (which are based primarily on voltage levels) because of differences in energy and demand losses across voltage levels. In this study, for residential and secondary classes the energy loss is assumed to be 8 percent and the demand loss is as-

Classification

Classify costs related to each function according to the reason(s) for the activity—to meet peak demand, to provide energy, or to connect customers to the system and to bill them.

Allocation

Allocate costs to each customer class/rate schedule—residential, secondary voltage, or primary voltage.



Note: Demand is often split into coincident (system peak) and noncoincident (class peak) components. Similarly, there are usually more than three rate schedules.

sumed to be 13 percent. For the primary class the assumptions are 5 and 8 percent, respectively, and for the high voltage class, 3 and 4 percent, respectively.

Demand-related distribution costs for the residential, secondary-voltage, and primary-voltage classes also vary because of differences in demand losses. There are no demand-related distribution costs for high-voltage customers (i.e., large industrial customers) because these customers take service directly from the utility's transmission system and provide their own distribution equipment. However, customer-related distribution costs increase with voltage level because of the increased expenses associated with the demand metering, meter reading, and billing activities required for larger customers.

These unit marginal costs can be expressed on a ¢/kWh basis by using each rate schedule's energy, demand, and customer profile. That is, the results on annual energy use per customer and peak-demand per customer from Table 2 can be combined with the unit marginal costs from Table 1 to yield marginal costs on a per kWh basis, shown on the left side of Table 3. Comparison of these marginal costs with marginal revenues for 1987 (based on existing rate schedules) shows the profitability for each class (right side of Table 3).

The estimated marginal costs for new customers in 1987 are highest for residential (6.6 ¢/kWh) and lowest for high-voltage customers (2.3 ¢/kWh). For existing customers, costs are lower because there are no incremental distribution costs associated with hooking up new customers or incremental costs associated with reading meters and preparing monthly bills. Costs are again highest for residential (4.0

Table 1

Summary of unit marginal costs for 1987 (1987-$)

Cost component[a]	Rate schedule Residential	Secondary	Primary	High voltage
Production				
¢/kWh @ meter	1.3	1.3	1.2	1.2
$/kW @ meter[b]	43.5	43.5	40.8	39.4
Transmission				
¢/kWh	0.4	0.4	0.4	0.4
$/kW[b]	5.5	5.5	5.2	5.0
Distribution				
$/kW[b]	41.1	41.1	38.6	0
$/customer[c]	287.1	807.5	1933.6	1933.6
Billing				
$/customer[d]	61.2	61.2	61.2	61.2

[a] Costs are calculated at the meter; that is, they include transmission and distribution losses. All transmission, distribution, and billing costs are assumed to remain constant over time. The production costs shown here are for 1987; Figure 1 shows how these costs increase over time.

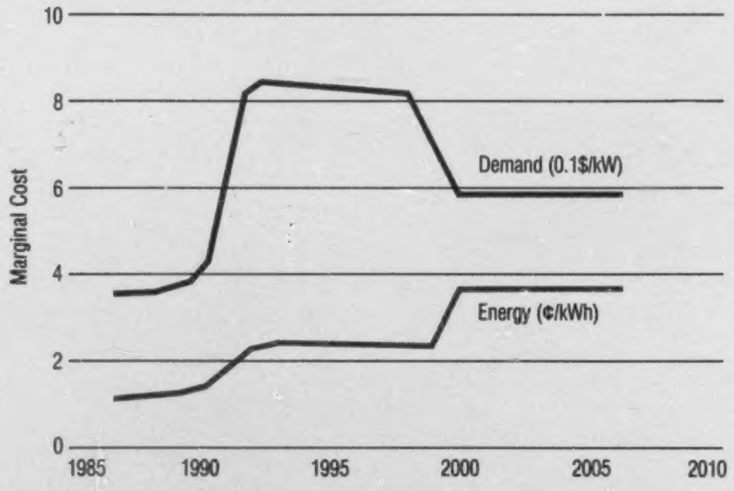
[b] These costs are computed on the basis of contribution to system peak.

[c] These are the costs associated with hooking up a customer at a new installation; they do not apply to existing installations.

[d] Meter-reading and billing costs are assumed invariant with the amount of electricity a customer consumes; therefore, there are no marginal billing costs for existing customers.

Figure 1

Assumed Production Costs 1987–2006



Note: Demand costs have been reduced by a factor of ten to improve readability. They should be multiplied by ten to convert to $/kW. Costs are given in fractions of 1987 dollars.

¢/kWh) and lowest for high-voltage customers (2.3 ¢/kWh). Marginal costs are highest for residential customers because they have high customer-connection costs per kWh and low load factors (Table 2). High-voltage customers, on the other hand, have high load factors (and, therefore, low demand costs per kWh of electricty use) and no demand-related distribuion costs.

Table 3 shows that marginal revenues are below marginal costs for new residential and secondary-voltage customers, in part because contributions in aid of construction are not included in revenues. These results suggest that the utility should not encourage new construction in its service territory and that it should examine its hookup fees and other charges associated with connecting new customers. Marginal revenues are slightly higher than marginal costs for new primary and high-voltage customers. (The results in Table 3 for new customers do *not* imply that these customers should be encouraged to increase or decrease their electricity consumption; differences in results between new and existing customers are due entirely to the costs associated with provision of service to a new customer, not to incremental changes in consumption.)

Marginal costs are below marginal revenues for existing customers in all classes in 1987 (although the difference is very small for the high-voltage class). These results suggest that short-term sales-promotion programs may be attractive, especially if aimed at the residential and secondary-voltage classes (for which the difference between marginal revenues and costs is the greatest). However, energy-efficiency programs may also be a good investment for the utility, even in the short-term, if the cost of conserved energy is less than the marginal cost of new production.[4]

Whether or not a situation with marginal costs below marginal revenues should lead to sales-promotion programs depends strongly on the economic tests used to assess demand-side programs.[5] If a rate-impact measure is used (which focuses on electricity prices), programs that increase consumption may be called for. On the other hand, if the utility revenue-requirements test or the total-resource test is used, efficiency programs may be warranted. The revenue-requirements test focuses on utility bills (the product of electricity prices and consumption), while the total-resource test includes the customer costs associated with efficiency improvements.

Meaningful conclusions concerning specific customer programs can only be obtained by examining individual end uses and their load shapes for customers on a particular rate schedule over the lifetime of the measures and programs. Three examples will be used here to illustrate of the uses of a marginal COSA.

Table 2

Customer data used to analyze marginal costs

	Fraction of total		
Voltage level/class	**Peak demand**	**Energy**	**Customers**
Residential	0.61	0.55	0.90
Secondary	0.21	0.20	0.10
Primary	0.07	0.09	b
High voltage	0.11	0.16	b
Total	1.00[a]	1.00	1.00

[a] The system load factor (ratio of average annual demand to peak demand) is 49 percent. Load factors for the residential and secondary classes are lower than average, while load factors for the primary and high-voltage classes are higher than average.

[b] These classes include less than 0.5 percent of the utility's customers.

Table 3

Marginal costs and revenues for 1987 (¢/kWh)[a]

	Marginal cost			Profit	
Voltage level/class	**New customer**	**Existing customer[b]**	**Marginal revenue**	**New**	**Existing**
Residential	6.6	4.0	5.1	–1.5	1.1
Secondary	6.0	3.9	4.7	–1.3	0.8
Primary	3.3	3.2	3.6	0.3	0.4
High voltage	2.3	2.3	2.4	0.1	0.1

[a] These costs are based on the 1987 unit marginal costs (Table 1) and the levels of energy use and contribution to system peak for each class (Table 2).

[b] These figures exclude customer-related distribution and billing costs (Table 1).

E. Braverman / Uniphoto

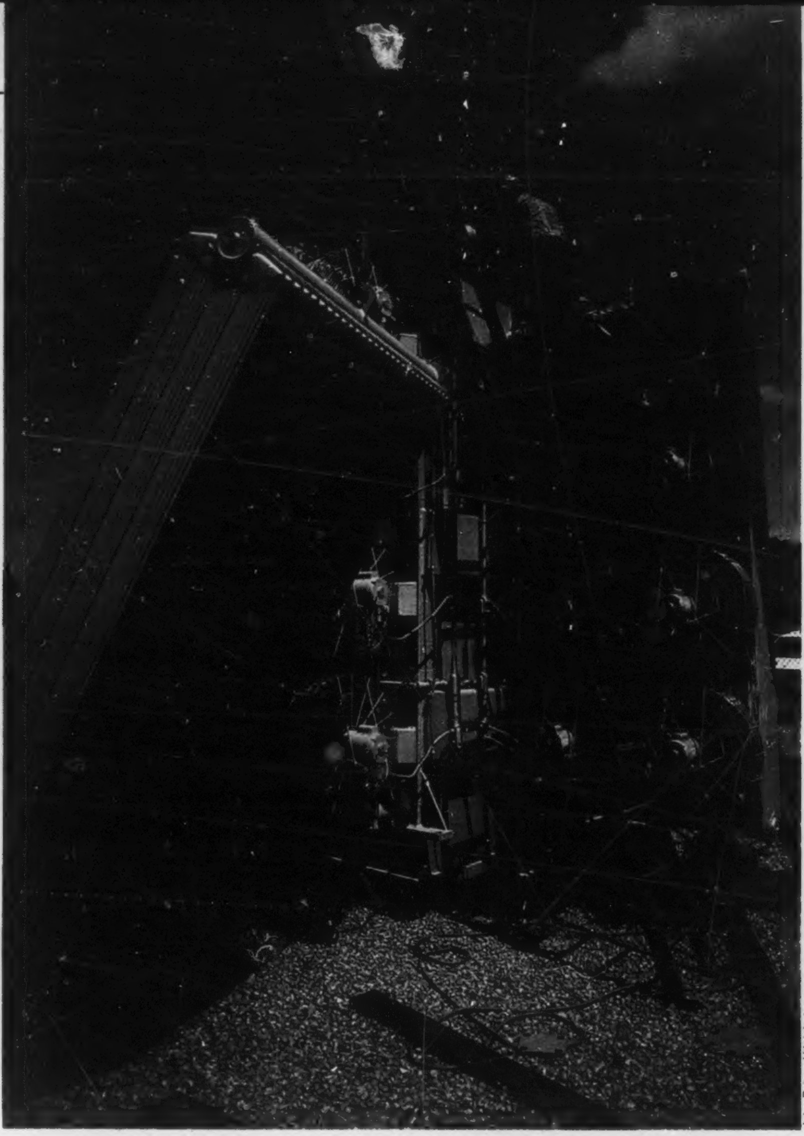
Residential Water Heating

Consider a utility program aimed at meeting competition from the local gas company.[6] In this example, the gas company is encouraging its gas-heat/electric-water-heat residential customers to switch to gas water heaters. The electric utility, contemplating a program intended to retain its electric water-heating market share, develops the following estimates: the typical household has a 52-gallon water heater and consumes 5000 kWh/year for water heating; the diversified demand at the time of system peak (i.e., the demand averaged across all residential water heaters) is 1.0 kW/unit, which yields a load factor of 64 percent.

If a customer switches from electricity to gas for water heating, the electric utility's production and transmission costs are reduced accordingly. However, there are no cost savings for distribution (the distribution system is already in place and cannot be moved) or for meter reading/billing (the household is still using electricity for other purposes). Thus, based on the values in Table 1 and the estimates developed for the water-heating analysis, the utility finds that its marginal costs are reduced by about $130/year for each electric water heater converted to gas in 1987.[7]

On the other hand, the marginal revenue collected from households in 1987 for water heating, based on the second block rates in Table 4, is $250/year ($0.050 × 5000 kWh). The difference between marginal revenue ($250) and marginal cost ($130) is a loss of $120/year.

Repeating this calculation year by year for ten years (the assumed lifetime of residential water heaters) and cumulating the discounted values for future years yields the net present value (NPV) of the total loss to the utility for electric-to-gas conversion. Under the assumptions developed here, the utility loses an NPV of $430 for a converted water heater in 1987.[8] Thus, the utility could afford to spend up to $430 for each electric water heater that is retained (i.e., does not convert to gas).



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Because distribution and customer service costs remain fixed, this utility loses $120/year when a customer switches from an electric to a gas water heater.

Because it is assumed that production costs increase with time while rates remain constant, the benefits of retaining water-heating market shares decline over time. Prevented conversions are worth only $340 in 1988 and $250 in 1989. They are no longer beneficial to the utility after 1991.

Consequently, in designing its program to encourage customers to stick with electric water heating, the utility should consider promoting high-efficiency water heaters (i.e., those with more insulation than the ones being replaced) and other devices to reduce electricity use for water heating. Although the benefits of retaining water heaters in the short term is reduced, a program that combines efficiency improvement with market-share retention accomplishes two objectives: it improves the utility's short-term financial situation without ignoring the longer term implications and it provides improved electricity services to participating customers.

Residential Space Heating

Use of electricity for space heating in new homes is a more difficult situation to analyze than is water heating in existing homes. Here there are at least three choices: a house that uses electricity only for lights and appliances (LA), an all-electric house that meets the current state building code, and an all-electric house that exceeds typical standards for energy efficiency.

These choices raise two questions: (1) should the utility encourage electric space heating (rather than gas heating) and (2) how much money can the utility spend to encourage builders of electrically heated homes to choose high-efficiency electric space heating?

The electricity-use assumptions for the three houses differ substantially, as shown in Table 5. Still, it is not clear how these differences affect the utility's costs. In particular, the distribution system could be designed to meet the potential peak demand of all-electric homes built to existing standards. If this is the utility's policy, then the LA homes (with a demand of 1.2 kW) are provided with service capable of meeting a demand for 5.5 kW. Such a policy provides insurance in case residential customers decide later to switch space- and water-heating fuels to electricity. This could happen if, for example, the price of natural gas increases dramatically. It would be much more expensive to upgrade the distribution system at that time than to build a larger system in the first place. In this case, the incremental distribution construction cost to serve an all-electric home is zero.

On the other hand, the utility could decide to reduce its construction budget and to build its distribution system to meet only the current load. In this case, the all-electric state-code home would impose an incremental construction cost on the distribution system of 4.3 kW.

The utility's distribution-system design standard will depend on three factors: the relative costs of increasing capacity at the time of construction versus subsequent retrofits, the estimated likelihood that customers will switch heating and

Table 4

Assumed rate structures for residential and primary voltage customers

	Rate schedule	
	Residential	Primary
Monthly charge ($)	5	51
Energy (¢/kWh)		
block 1	4.5 (<600 kWh)	2.3
block 2	5.0 (600–1500 kWh)	---
block 3	5.8 (>1500 kWh)	---
Demand ($/kW-month)	0	6

Table 5

Residential electricity use for new construction

	House type		
		All-electric	
End use	Lights & appliances	State code	High efficiency
Baseload			
Use (kWh/yr)	7000	7000	7000
Peak (kW)	1.2	1.2	1.2
Water heating			
Use (kWh/yr)	---	5000	5000
Peak (kW)	---	1.0	1.0
Space heating			
Use (kWh/yr)	---	6900	4700
Peak (kW)	---	3.3	2.0
Total			
Use (kWh/yr)	7000	18,900	16,700
Peak (kW)	1.2	5.5	4.2

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Meaningful COSA results can only be obtained by examining specific programs for specific customers over specific timeframes.

With COSA, utilities can design exterior lighting programs that enhance customer service and increase net revenues.

water heating fuels to electricity, and the estimated time over which customers are assumed to switch fuels. The marginal COSA provides useful information for such a policy decision.

Assuming that the distribution system is sized to meet the demands of all-electric homes (5.5 kW), the cost in 1987 of serving the LA home is $750/year and the revenue collected is $370/year, yielding a loss in 1987 of $380.[9] Over the 20-year lifetime of the analysis, the NPV of the loss totals $5590. This loss shows that the existing rate structure does not match costs.

The marginal COSA results suggest that the monthly customer charge could justifiably be increased from its present value of $5 to almost $20. In addition, the energy charge (block 1) could be increased, from 4.5 to 5.8 ¢/kWh. Opposition to such rate-structure changes would probably focus on equity considerations. Low-income households would be most adversely affected by increases in the monthly customer charge and initial block charge, especially if income and electricity use are closely correlated.

Similar calculations show that the NPV of the difference between revenues and costs for the all-electric state code home is a loss of $5830. Because this loss is greater than that for the LA homes, the utility should not promote electric space heating, given its existing rate structure. The NPV for the high-efficiency home shows a loss of $5420. The difference in loss between the state code and high-efficiency home suggests that the utility could spend up to $410 (the difference between $5830 and $5420) to market these high-efficiency homes to builders and homebuyers who have decided to heat with electricity.

Lighting for Office Buildings

Consider a large (50,000-square feet) all-electric office building that uses 250,000 kWh/year and is billed on the primary voltage rate schedule shown in Table 4. The building's peak demand, caused by a combination of HVAC equipment and lighting, is assumed to be 80 kW.

A proposal is made to increase lighting to better illuminate the building's exterior and adjacent parking lot at night (for improved security and employee safety as well as aesthetics). The additional lights would operate for an average of 10 hours/night every day of the year. If the connected load for these new lights is 10 kW, annual consumption would be 36,500 kWh. Finally, assume that the probability of these lights being on at the time of system peak is 50 percent; thus, the contribution to peak demand is 5 kW. The contribution of the new lighting system to the building's (and the utility system's) peak demand could be limited with a computerized energy management system. Such a system could sequentially turn off these lights as other building loads increased each morning.

Regis Lefebure / Uniphoto

The incremental annual costs of serving these new lights in 1987 would be $1000/year and the marginal revenue collected would be $1200/year, $200 more than the marginal cost.[10] Note that there is a demand-related distribution cost associated with this incremental load that was not relevant in the water-heating example (because that situation involved a loss of load).

Whether or not this is an attractive program for the utility to pursue depends in part on the lifetime of these new lighting systems. Large office buildings frequently undergo extensive changes in occupancy and remodeling, which could involve modification to these lights. If the lighting system is expected to last only five years, the NPV of the revenues minus the costs is $470. However, if the lights are in place for six or more years, the costs exceed the revenues. A seven-year system, for example, would cost the utility $190 more than it would receive in revenues. The change from profit to loss is caused largely by the sharp increase in marginal production costs assumed for 1990. (See Figure 1.)

Given uncertainties about the lifetime of such lighting systems, the utility might opt to promote exterior lighting as a valuable electricity service, using only high-efficiency lamps, reflectors, and fixtures. A high-efficiency system will impose less of a long-term cost on the utility than will a conventional system, will provide the same level of service to the customer, and will reduce the customer's electricity bills. Here, too, results of a marginal COSA can help the utility identify the costs and benefits of such a program.

Conclusion

A marginal cost-of-service analysis offers a powerful and straightforward way to help assess the benefits and costs of various types of demand-side programs that an electric utility might implement. Such analyses can provide much more detail about end use, customer class, voltage level, and rate schedule market segments than other analytical methods used by utilities.

As illustrated here, marginal COSA can identify the incremental revenues and costs to a utility of different customer programs aimed at increasing energy efficiency, retaining market share, or increasing sales for particular market segments. The ways in which results from such a cost study are used, and their implications, depend in large part on the economic tests used by the utility and its regulatory commission to assess demand-side programs. The differences between annual costs and revenues can be computed under different assumptions about present and future costs and rate structures. The primary outcome of such an analysis is an estimate of the amount of money the utility can justify spending (the net present value of the difference between marginal revenues and marginal costs) to operate the particular demand-side program. Combined with information on customer characteristics and preferences, marginal COSA can help in the design of improved demand-side programs that lower electricity prices and that deliver desired services to customers. ▰

Notes

1. The article is an abbreviated version of *Marginal-Cost-of-Service Analysis: A Powerful Marketing Tool for Electric Utilities* by Eric Hirst (ORNL/CON-251, Oak Ridge National Laboratory, Oak Ridge, TN, February 1988).

2. C.F. Phillips, Jr., 1969, *The Economics of Regulation, Theory and Practice in the Transportation and Public Utility Industries*, Richard D. Irwin, Inc., Homewood, IL.

3. J. Chamberlin, 1981, *Costs and Rates Workbook*, ICF, Inc., prepared for the Electric Utility Rate Design Study, Electric Power Research Institute, Palo Alto, CA, September.

J.R. Malko, D. Smith, and R.G. Uhler, 1981, *Costing for Ratemaking, Topic Paper*, also prepared for the Electric Utility Rate Design Study, August.

National Economic Research Associates, 1977, *How to Quantify Marginal Costs: Topic 4*, also prepared for the Electric Utility Rate Design Study, March.

4. R. Cavanagh, 1987, "Why Utilities Should Invest in Energy Efficiency While Choking on Capacity Surpluses," presented at the conference on "Apples to Apples Planning, Moving Toward Integrated Value-Based Planning: The Issues," sponsored by the Electric Power Research Institute, Palo Alto, CA, December.

5. California Energy and Public Utilities Commissions, 1987, *Standard Practice Manual for Cost-Benefit Analysis of Demand-Side Management Programs*, staff draft, Sacramento and San Francisco, CA, August.

E. Hirst, 1988, *Regulatory Responsibility for Utility Integrated Resources Planning*, ORNL/CON-249, Oak Ridge National Laboratory, Oak Ridge, TN, January.

6. L.R. Doll and R.T. Howard, 1987, "Marketing Utility Demand-Side Management in a Competitive Environment," *Demand-Side Strategies in Transition*, Proceedings of the Third National Conference on Utility DSM Programs, Synergic Resources Corp., Bala Cynwyd, PA, June.

7. Production-related energy costs are reduced \$65 (\$0.013 kWh × 5000 kWh). Production-related demand costs are reduced \$43.50 (\$43.5/kW × 1 kW). Transmission-related energy costs are reduced \$20 (\$0.004/kWh × 5000 kWh). Transmission-related demand costs are reduced \$5.50 (\$5.5/kW × 1.0 kW).

8. Marginal cost assumptions are presented in Table 1 and Figure 1. It is also assumed that real electricity prices remain constant over the 20-year analysis period, a plausible assumption since the utility wants to keep costs low due to competitive pressures and since production costs increase only at the margin. Because rates are based primarily on average costs, marginal production-cost increases have only a modest effect on rates.

9. Marginal cost = (\$0.013 + \$0.004) (7000 kWh) + (\$43.5 + \$5.5) (1.2 kW) + (\$41.1) (5.5 kW) + (\$287 + \$61) (1 customer). Marginal revenue = (\$0.045) (7000 kWh) + (\$5) (12 months).

10. Marginal cost = (\$0.012 + \$0.004) (36,500 kWh) + (\$40.9 + \$5.2 + 38.6) (5.0 kW). Marginal revenue = (\$0.023) (36,500 kWh) + (\$6) (12 months) (5 kW).

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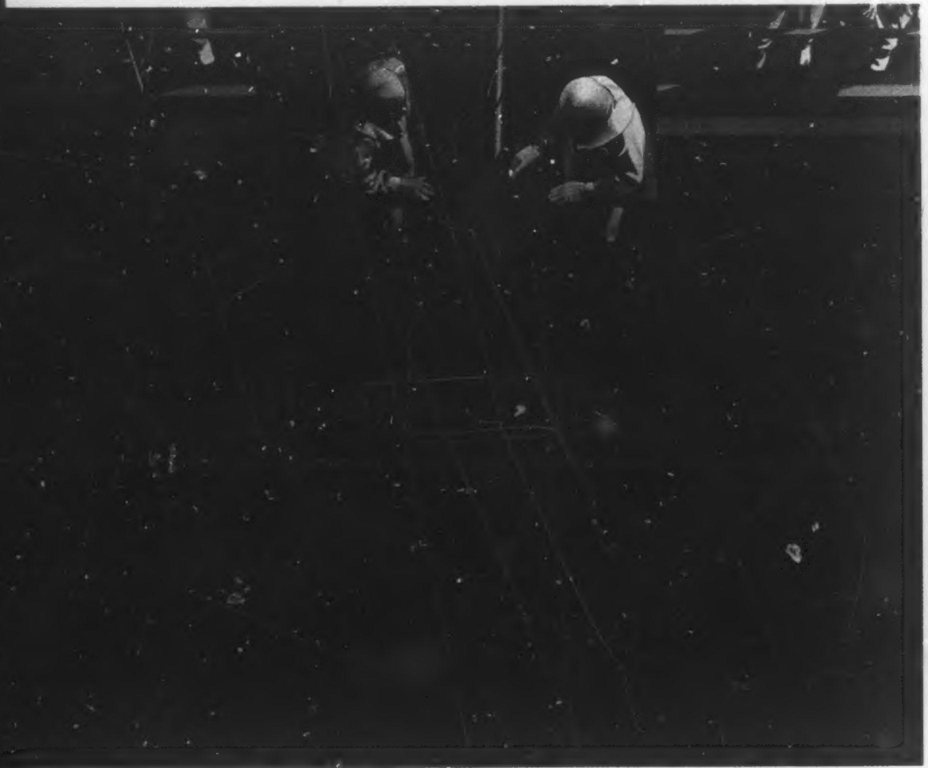

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Joel S. Gilbert

Cogeneration: Competition or Resource?

The answer depends in large part on how well utilities listen to their customers.

Few topics within the electric utility industry generate more diversity of opinion than cogeneration. Many utilities, some more willingly than others, have been struggling for years to incorporate cogenerated power into their generation plans. Now, some companies view cogeneration as a growing opportunity for their unregulated subsidiaries; others see cogeneration as an unmitigated threat to their business.

Why this tremendous difference in outlook?—because, depending on the specific situation involved, cogeneration can be a valuable resource or an impressive competitor.

On the supply side, the difference between cogeneration as an asset and cogeneration as a liability hinges largely, if not entirely, on the terms and conditions negotiated—cost, capacity factor, dispatchability, etc. Of course, it's not easy to get all those terms negotiated as one would like. In fact, one of the problems is that the utility often is not dealing with its customer, who may merely be acting as a thermal host for the project, but with a perfect stranger—the project developer, the equipment supplier, an engineering services firm, etc.

Demand-side cogeneration usually elicits a more universal response. Here the customer is displacing power purchases, and there are fewer circumstances when that can benefit the utility.

Utility Attitudes

Still, though most utilities see such cogeneration as competition pure and simple, attitudes toward that competition vary. Some utility executives seem to believe customers are merely curious about the novelty of cogeneration and will certainly lose interest when they look at it a bit closer. And, in fact, despite the national attention given to demand-side activity in the Northeast, California, and along the Gulf Coast, there are relatively few such projects installed.

Other utility managers believe (or hope?) that should these whimsical customers install demand-side cogeneration equipment they will abandon the systems once they realize how difficult it is to be in the power business. There are even those who think wily customers are simply bluffing, trying to force their electric utility to give them a lower price.

Indeed, that is one of the misconceptions about cogeneration in general—since such projects displace power purchases, the primary driver must be price, right? Wrong. Our in-depth studies of cogeneration projects and their alternatives over the last four years, involving 62 electric utilities from coast to coast and border to border, demonstrate that demand-side cogeneration activity does not correlate to the price of power. Two years ago, most demand-side cogeneration activity was spawned by failing or inefficient steam or hot water boilers. Customers who felt they "had to do something anyway" saw cogeneration as the solution to their inadequate system. More recently, power reliability has passed thermal efficiency as the customer problem most frequently driving cogeneration projects.

In either case, the trouble for at least some utilities is that they don't understand their customers' thermal systems. Consequently, they are not well prepared to suggest cost-effective alternatives to the cogeneration solution to a customer's problem.

The repeated attempts of the marketing department to get management attention and direction in these circumstances are sometimes met with "Here we go again!; The marketeers are crying wolf; They want us to give away the farm!" criticisms. It isn't until the first projects go in and the electric meter slows down that these executives scream down the hall "What the *%$#@*! has happened?" Other times, when the handwriting on the wall is especially clear even before the system is installed, a utility may think it has no alternative to granting a significant rate discount to discourage the customer from generating. Little do these utilities realize that there were much less costly alternatives, if only they had listened to their customers and their own marketing representatives earlier.

There are also those in electric utility management who are desperately searching for some "cure"

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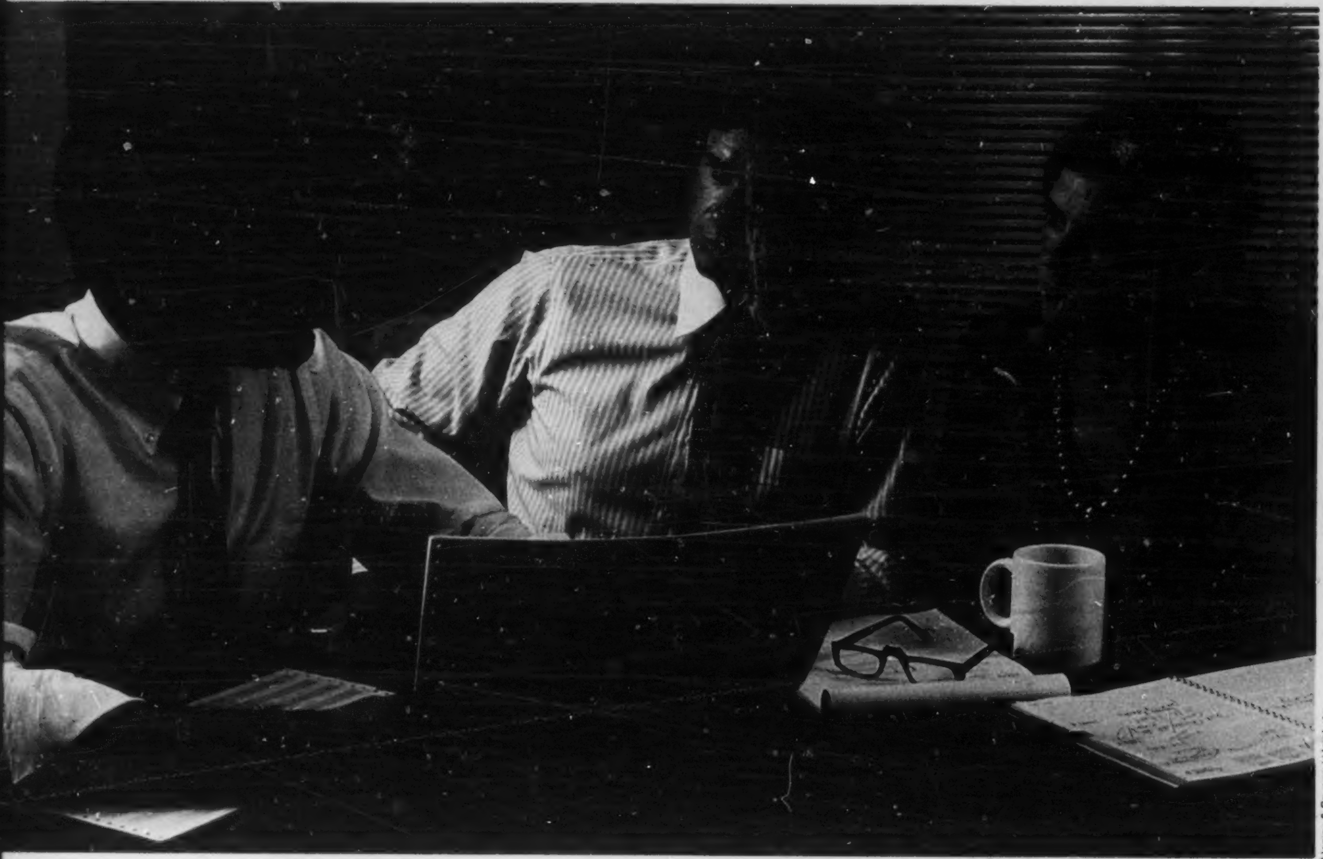
This Pennsylvania cogeneration plant uses upgraded culm to produce steam and electricity.



Henley & Savage / Uniphoto

or "magic potion" they can spread over their service territory to get their customers to forget about the whole idea. A common view in this camp is that the electric utility shouldn't even talk to customers about cogeneration. The electric utility should only talk about alternatives, hoping against hope that its customers aren't even thinking about it. The common themes here are that thermal storage, the industrial heat pump, pinch technology, and high efficiency electrotechnologies are superior to cogeneration. They may well be, but your marketeers will not get a chance to present them until your customer's curiosity about cogeneration is satisfied.

We liken the problem to talking to your children about sex. You come home one night and your 13-year old asks you some very specific questions. If you are like most parents, you are tempted to dismiss your child's questions as idle interest . . . certainly not pertinent to his or her situation. What is really at the root of your discomfort is your own inadequacy to be a good counselor and guide for your child. You don't really want to listen. Why, you know best. You really want to force your child to listen to you. You certainly don't want to simply explain the facts and let your child decide what to do, do you?

The problem with all of these attitudes—which range from apathy to hostility, from panic to condescension—is that they tend to avoid open, productive customer interaction. To return to the parent-child analogy, the simple fact is you can't force your children to listen to you. They will ultimately make their own choices. You can't force your customers to listen to you either. They each will go their own way.

Helping customers understand and solve their energy problems is a utility's best defense—and offense—against undesirable cogeneration projects.

But you are accountable for the relationship you build with your customers. You want them to come to you for advice. You want them to believe you are unbiased and only concerned about their well-being.

Helping Customers

Many utilities recognize that simple truth. Their attitude can be characterized as "Let's work closely with our customers on a one-on-one basis to solve their energy and competitive pressure problems." These utilities know that cogeneration is only a threat when they fail to use it as an opportunity to improve their customer's operating efficiency and the customer service relationship. Cogeneration is the best energy choice for few custom-

Stacy Pick / Uniphoto

Mark Borchelt / Folio, Inc.

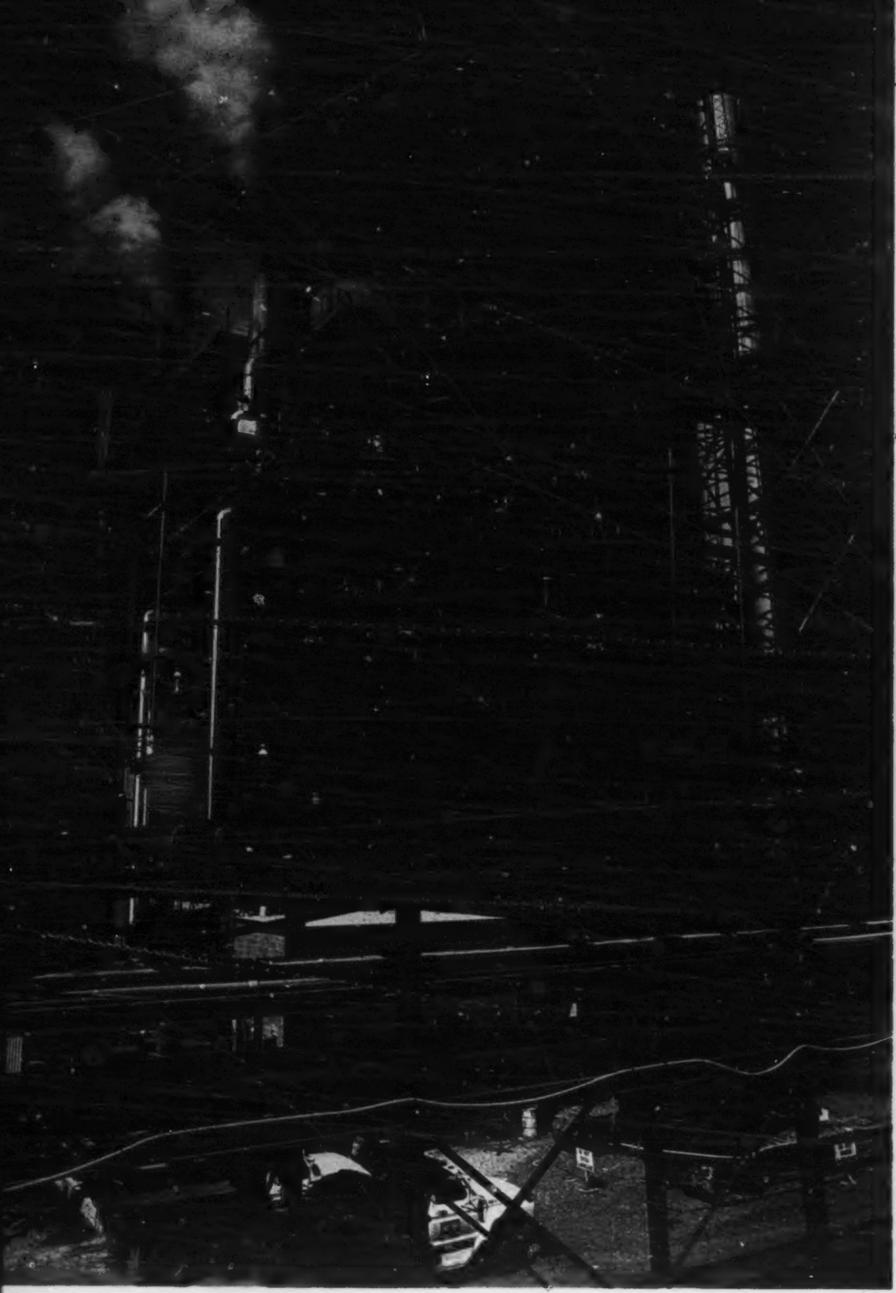
Supermarkets and hospitals are two favorite targets for promoters of packaged cogeneration systems, even though high-efficiency electric alternatives can often supply their energy needs more economically.

ers. Unfortunately, many customers simply do not know about the alternatives or how to assess them on a comparable basis. Who better than you and your staff to assist them in assessing their energy needs, comparing technologies, and performing the required electric rate computations?

A key point is that we are actually in the people business—not the power business. Electricity just happens to be the commodity we sell, and our customers buy it because they believe it will help them succeed (meet their needs). Therefore, relationships are an essential ingredient. Electric utilities must have an open, trusting relationship with the cogeneration host and the project developer. This is essential regardless of whether the project is a supply-side or a demand-side cogeneration system.

Hospitals, hotels, fast-food chains, and supermarkets—your customers—are being approached by "guaranteed savings or guaranteed lower price" deals. Some of these lures are total deceptions playing upon your customers' inability to understand your electric rates. Customers often become so confused they simply resort to the use of an average price for power. As a result, they fall easy prey to these "no up front money" scams.

These customers clearly need their electric companies' help. Yet a



Ron Sherman / Uniphoto

Paper mills and oil refineries are among the few natural candidates for cogeneration.

recent survey conducted by the Cogeneration Institute suggests that few of them are getting that help. (Even though the survey was within a narrow market segment, the institutional cogeneration market, we find it accurately reflects a more general problem.) The survey found that 94.4 percent of the customers who had chosen to cogenerate were happy about their decision, but that only 5.7 percent of these customers had found their serving electric utility to be of help in making their cogeneration decision.

We know of several situations where a customer installed cogeneration in an attempt to reduce their cost of electricity. After installation, their total energy bills rose. The packaged system they had installed failed to reduce their demand costs, and the incremental operating costs for the system were higher than the serving electric utility's energy charge. So, what did these customers do? They looked at the purchase of another cogeneration system!

Bizarre, you say? No, not really. You see, these customers and many others do not understand electric rates. In some cases, they can't even interpret their own bills. Our meet-

Gregg Marcuso / Uniphoto

ing with one of the world's largest owners and managers of commercial real estate proved that point to us. They were considering packaged cogeneration at one of their properties in the Northeast. Their preliminary economies indicated it would easily produce a two-year return on investment. We were given a portion of the cogeneration developer's proposal and discovered that the value used for the price of electricity was twice what the serving electric utility actually charged. We called the engineer who had approved the packaged cogeneration system (at $2,500 per kilowatt installed for the 100-kilowatt unit) and pleaded with him to reconsider the project, explaining that he had misinterpreted the electric rate schedule.

No, he insisted that the project had undergone a thorough review. He had the bills right there in front of him. Finally, out of desperation, we warned him that his misinterpretation would result in management embarrassment and that there was absolutely no way his savings could even cover debt service for the project. Working under the auspices of the electric utility serving him, we pleaded for an opportunity to meet with him to offer alternatives, and he reluctantly agreed. What was his problem? He couldn't figure out the on-peak and off-peak bill. He was looking at the on-peak period and assuming that price applied to the off-peak period as well!

This is only one of several stories that could be told to illustrate the same lesson: many of your customers cannot understand how to make their power purchase decisions more economic. Think about it. What other purchase does your customer make that is so difficult to price before the purchase is made?

Of course, it would be unfair to put all demand-side projects in this category. Some of your customers do understand electric rates. Some have been cogenerating for decades. Natural cogeneration candidates include pulp and paper companies, petroleum companies, tire makers, and others with efficient steady steam use.

For most electric utilities, however, these customers represent a very small minority. Most customers are not natural cogeneration candidates. More often than not, they are marginal or poor candidates. The only reason these customers are considering cogeneration is that superior alternatives are not being offered. With all the hype from hungry deal makers, equipment suppliers, state energy offices, and regulators who insist cogeneration is the customer's best energy choice, we shouldn't really be surprised by their interest.

> The most important "thing" a utility should be doing is listening to its customers. Find out how your customers feel about your company and improve their perception and/or the reality of your service to them. Take on their problems as your problems. . . . If your customers have a problem, YOU have a problem.

Listen Closely

What then should a utility be doing? The most important "thing" a utility should be doing is listening to its customers. Find out how your customers feel about your company and improve their perception and/or the reality of your service to them. Take on their problems as your problems, rather than defending the system and process that got them to that point. If your customers have a problem, YOU have a problem.

Think through your position on cogeneration. Where could it meet your customers' needs and yours? Is cogeneration the best alternative for your customer? If your customer should be cogenerating and you are not in need of the capacity, you might consider a deferral arrangement (where the customer gives you the full capital in exchange for a portion of the anticipated savings). If your customer's needs are better met with alternative technologies, offer to provide that assistance as well.

Where your customers are dissatisfied with their power reliability, help them determine how their problems can be resolved. Lease them an uninterruptible power supply if that solution best meets their need. If their boilers are failing, help them analyze steam system conservation options and alternative heating technologies. Perhaps you should lease them a new boiler. If they want to lower their price for power, show them how to manage their purchases more wisely. And, if they are interested in an energy deal, make them one yourself.

Cogeneration can be a least-cost resource or a costly competitive problem. Which way will it go in your service territory? To find out, talk to your customers. Use executive-to-executive and manager-to-manager meetings, customer luncheons or seminars, or any other appropriate method to spend time with your customers. They really want to talk to you and will tell you most of what you really need to know. Within a very short time, maybe as little as a year, you won't be worrying about whether cogeneration will be a competitor or a resource. Your marketing efforts will have settled that question.

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Vice President
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Eric Luse

Diversification and Thrifts

Some electric utilities are finding that savings and loans offer them an attractive investment opportunity.

In 1986, Pinnacle West Capital Corp., the holding company for Arizona Public Service Co., acquired Merabank, the largest savings and loan association in Arizona with assets in excess of $7 billion, for approximately $422 million. The purchase price represented a 75 percent premium over book value, an average premium for many savings and loan acquisitions during that year. More recently, Hawaiian Electric Co. acquired American Savings Bank, FSB, in Hawaii, for approximately $112 million. Other utilities, including Public Service Electric & Gas and El Paso Electric, have also invested in or acquired control of savings and loans recently.

Utilities' investing in savings and loans is part of a larger diversification movement within the industry related to the reduction of many utilities' long-term construction programs. Investor-owned electric utilities project spending $71.8 billion for electric utility construction during the next three years, a 31 percent drop from the construction spending forecast for the 1982–1984 period.[1] Capital which may now be available is, in turn, generating investment opportunities for utilities. Some of these utilities are considering market expansion and diversification opportunities as part of a long-term strategy to improve financial flexibility and to enhance shareholder values and service to customers.

Of course, diversification of any kind presents potential risks as well as rewards, since it requires involvement in new lines of business, not all of which may be consistent with a particular utility's current activities. For utilities that are able to diversify, the most difficult issue may not be whether to diversify, but instead what line of business the utility should diversify into. Addressing this question requires consideration of a variety of factors including the potential economic returns vis-a-vis alternative investments, the risks associated with the new line of business, and its compatibility with the utility's existing operations. How this analytical exercise may take its course can be illustrated in the context of a utility's investing in or acquiring a savings and loan.

The Savings and Loan Model

Why are utilities investing in savings and loans in the first place? After all, savings and loan associations, perhaps more than any other industry in recent years, have had more than their share of adverse publicity. For the first half of 1988, the savings and loan industry suffered a net aggregate loss of approximately $7.5 billion. Hardly a day passes without a call for Congressional action to restructure the savings and loan industry or for taxpayer assistance in order to handle the massive thrift failures in the Southwest.

Although it would be foolhardly to underestimate the magnitude of the savings and loan and banking crises, behind all the negative headlines is an industry that has recovered very well from the double-barrelled effects of historically high levels of inflation in the late 1970s and early 1980s and inconsistent and haphazard deregulation during that period. Lest anyone forget, while the prime interest rate exceeded 20 percent in the late 1970s, most savings and loans were unable to offer anything other than fixed rate loans and below market rates on deposits. Since the principal source of income for savings and loans is their interest spread between rates paid on deposits, which are typically short term, and yields earned on longer term mortgages, the massive losses that naturally flowed from this highly inflationary environment should have come as a surprise to no one.

The decline in market interest rates in the 1980s produced remarkable improvements in savings and loan profitability. Over 75 percent of savings institutions were profitable in 1987 and for the first three-quarters of 1988. Moreover, the top 10 percent of thrift institutions insured by the Federal Savings & Loan Insurance Corp. (FSLIC) earned a return on assets of at least 130 basis points and a return on equity of at least 22 percent.

Many companies also have invested in savings and loans because of the advantages of the savings institution charter over other financial entities, combined with the industry's strong market position in residential lending and consumer deposits. For example, the residential mortgage market is the single

Eric Luse is a partner in the Washington, D.C., law firm of Brownstein Zeidman and Schomer. He specializes in savings institution mergers, acquisitions, and regulatory matters.

Steve Weber / Uniphoto

EXCHANGE COMPOSITE LIST
NEW YORK STOCK EXCHANGE INDEX
Of All Common Stocks
Weekly Close
LATEST WEEK
DAY BY DAY
M T W T F
NYSE
DOW JONES
AVERAGE
High & Low
VOLUME
IN MILLIONS
300
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As utilities' construction programs wind down, some companies are investing in new lines of business.

largest asset market in the country, representing nearly $3 trillion dollars in assets. Of an estimated $400 to $500 billion in one-to-four family mortgages originated in 1987, savings institutions captured a 45 percent market share.[2] Moreover, unlike commercial banks, FSLIC-insured savings and loans may be acquired by any type of institution, including utilities, insurance companies, and brokerage firms, so long as the thrift institution maintains at least 60 percent of its assets in residential real estate and related assets.

Savings and loans also offer significant opportunities for leverage. Unlike banks, savings and loans have a more lenient capital requirement that recognizes the lower risk inherent in single family lending. Specifically, although the minimum capital requirement for FSLIC-insured savings and loans is expected to increase to 6 percent of liabilities during the 1990s, the current requirement typically is below 5 percent of liabilities, permitting leverage of approximately 20 times.

Of particular interest to many investors are the broad powers savings and loans may exercise through subsidiaries. For example, such institutions may engage through their subsidiaries in securities brokerage and investment advisory services; real estate related powers, including building construction, real estate development, and leasing of real property; operating investment companies and limited partnerships; property management and leasing, and acquisition and sale of real estate; real estate brokerage; and insurance, including underwriting of mortgage life and credit life insurance.

In recent years, investors have sought to acquire troubled savings and loans partly because of the tax opportunities associated with such transactions. Acquirers may use the net operating loss carry forwards of a failing thrift under the special rules available to savings and loans that qualify for "G" reorganizations under the Internal Revenue Code. Moreover, under current law, FSLIC assistance payments are not taxed as income to the recipient, and the tax basis of purchased assets is not reduced by non-shareholder contributions capital. Lastly, savings and loans that qualify as "domestic building and loan associations" can deduct up to 8 percent of taxable income for additions to bad debt reserves, without regard to losses actually incurred.

In summary, the savings and loan industry may offer significant opportunities to the right type of investor depending upon its business and tax objectives. How these opportunities mesh with the business of a utility will depend upon the investment criteria established by the utility, which will most certainly include the three factors mentioned earlier: potential returns, investment risk, and compatibility with the utility industry.

Potential Returns

Although the savings and loan industry will not offer a utility the greatest potential return relative to other investment possibilities, many well-managed thrifts, including some of the largest institutions in the industry, have consistently reported net earnings at a rate greater

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According to some industry observers, the S&L crisis is largely confined to the Southwest, where hard times have depressed the real estate market, and left some depositors waiting futilely for their thrift to re-open its doors.

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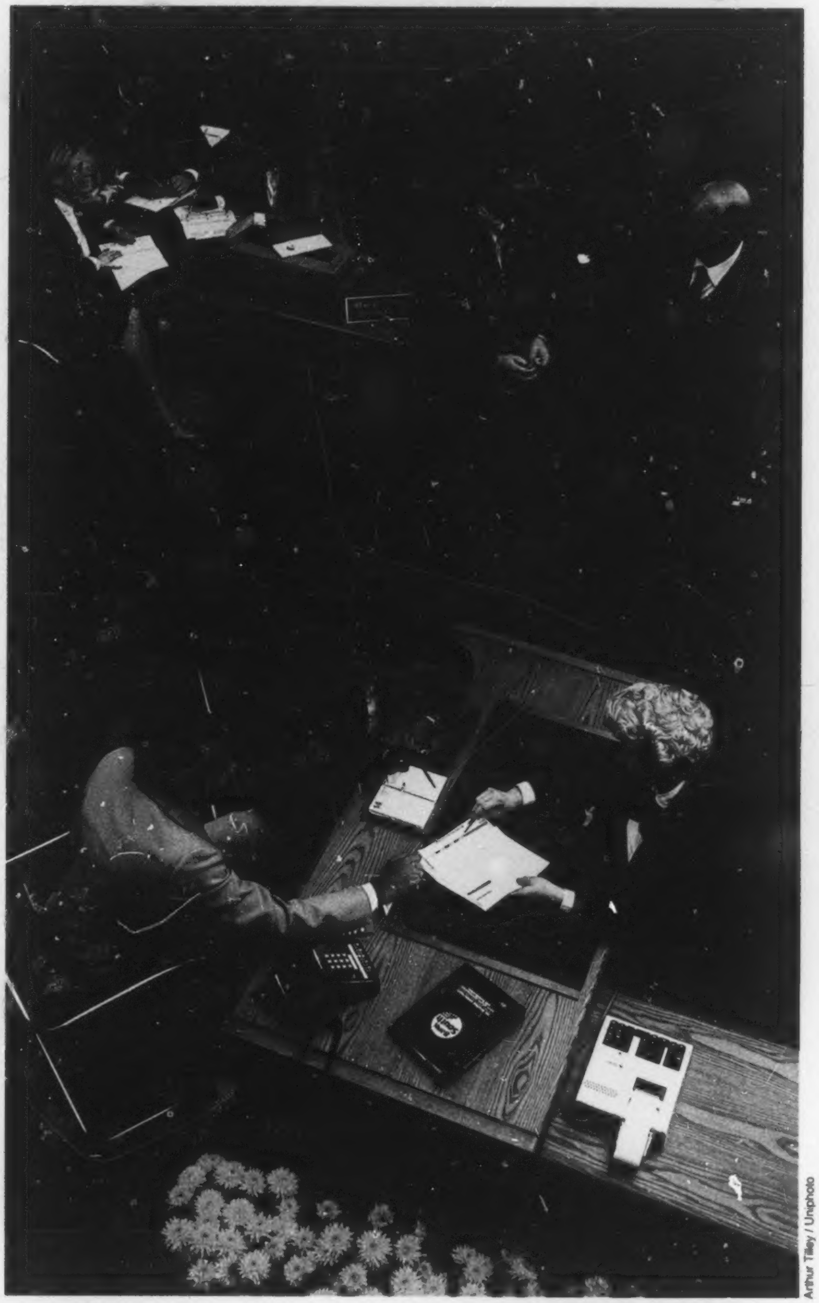
than a 20 percent return on equity.[3] While current industry averages are somewhat meaningless because of the huge losses being incurred by thrifts in the Southwest, an average annual return on equity in excess of 15 percent is not unusual.

The secret to the success of many thrifts is really simplicity.[4] By avoiding many of the risky business loans and real estate development activities that have significantly damaged some other thrifts throughout the country, and by concentrating on originating residential mortgage loans, taking deposits, and controlling overhead costs, one Northwestern thrift, for example, posted a 22.5 percent return on equity and a 2.73 percent return on assets of $1.9 billion during the past twelve months.

Another critical factor in evaluating potential return is purchase price. All things being equal, the less the capital investment required to purchase a thrift, the greater the potential return on equity. The silver lining in the current thrift crisis is that prices for both failing and healthy savings and loans are near historical lows. The stock of many publicly owned savings and loans is trading currently at less than book value. Buyers have also sought investment opportunities with failing savings and loans because of the ability to acquire control of an institution for book value or less and because of the attractive assistance that the FSLIC is providing purchasers in order to facilitate such acquisitions.

Investment Risk

Although the basic assets of a savings institution—highly collateralized residential mortgage loans—may not be viewed as inherently risky, a savings and loan investment is not without risk due to fluctuations in overall interest rates and economic downturns. Specifically, in the early 1980s most savings and loans suffered losses because their assets consisted primarily of long-



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term residential mortgage loans with below-market yields that were originated during periods of low interest rates, while their deposits were primarily short-term and at market rates. Many savings institutions have sought to minimize their exposure to changes in market interest rates by originating adjustable rate mortgage loans, extending the maturities of deposits and other liabilities, and using interest rate caps and swaps to hedge against rate risk. More recently, thrifts have faltered due to poor asset quality (related chiefly to loans secured by properties in the depressed Texas and other Southwest economies), to

Their knowledge about their residential customers and their service orientation can help utilities succeed in the S&L industry.

poor underwriting standards on commercial real estate loans, and to weak management.

Clearly, thrifts are not risk free. Pinnacle West, for example, recently had its first taste of this risk when its Merabank subsidiary reported a $12.4 million loss during the first quarter of 1988. Although Pinnacle West is positioning Merabank to be a major, if not the dominant, thrift in the Southwest during the 1990s, achieving its long-term goals may require riding out some short-term difficulties caused by downturns in the Southwest real estate market and rising interest rates.

Compatibility with Utility Operations

Perhaps the single most important factor to consider in making an investment in other industries is whether such an investment is compatible with the existing operations of the utility. Many utilities have found that one of the attractions of investing in a savings and loan is that the business is readily understandable and not terribly different from that of a utility. Specifically, a savings and loan is first and foremost a consumer-oriented business engaged primarily in originating mortgage loans and accepting deposits. The chief executive officer or financial vice president of a public utility is likely to conclude that the skills that he or she has learned in operating a utility are a solid foundation for operating a financial institution. The savings and loan industry is not so exotic as to require management to learn and understand a completely new line of business, or to require an extensive commitment of personnel and resources to grasp the new business.

The basic elements to a successful savings and loan operation—managing interest rate risk and asset quality—should be understood easily by a utility's management.

In addition, the regulatory structure of the savings and loan industry is not likely to deter a utility. Because utilities themselves operate in a highly regulated environment, they, unlike many private investors, may feel quite comfortable operating within the savings and loan regulatory scheme.

Lastly, many utilities may find that their broad customer base is very compatible with the customer base of a savings and loan. Already knowledgeable about those customers, management may discover opportunities for cross marketing savings and loan services to existing utility customers. Of course, this same compatibility may present disadvantages as well. For instance, the performance of utilities and savings and loans can be affected similarly by fluctuations in interest rates. How a utility values these similarities depends on its ultimate objectives.

The same is true of diversification in general. Some utilities will find that it offers them little while others will find that it can play a key role in their financial planning now or in the years to come. Whether the diversification is into financial services, energy-related services, communications, real estate, or some other area, the decision should involve a careful review of the long-term objectives associated with the investment, and whether those objectives meet the standards of return, risk, and compatibility developed by management of the utility. Under the right circumstances and when properly structured, diversification can be one of the best means of increasing long-term shareholder value.

Notes

1. *Electric Perspectives*, Fall 1988, p. 38.
2. *FHLBB*, "Purchasing an Insolvent Savings Institution through the FSLIC," p. 2.
3. See note 2.
4. Kaplan Smith, *Thrift Securities Review*, Vol. 4, No. 10, p. 11 (Oct. 3, 1988).

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TECHNOLOGY REVIEW

DOE SELECTS CLEAN COAL PROJECTS

The Department of Energy announced the winners of the second round of clean coal technologies awards on September 28. The 16 projects, valued at more than $1.3 billion, are intended to demonstrate improved techniques that could be used in the 1990s to reduce air pollution from coal-fired plants.

The government funding is part of a $2.5 billion commitment President Reagan made in March 1987 to boost U.S. funding for innovative pollution control technologies. The initiative, which expanded an earlier program directed by Congress, encompasses a series of government-run competitions between 1988 and 1992. Private proposers must at least match the federal share of funding if their projects are selected.

Secretary of Energy John S. Herrington said that if all 16 projects are negotiated successfully, they will receive $537 million in federal funds, which will be added to more than $800 million in proposed private-sector funding. Those projects will then join eight others, totaling nearly $800 million, already underway from first-round competition.

Thirteen award-winning projects involve advanced pollution control equipment that can be retrofitted to existing coal-burning facilities. Three involve repowering technologies that can boost power plant generating capacity as well as reduce emissions. Two of the retrofit projects focus on industrial manufacturing processes rather than on power generation processes.

Southern Company Services, Inc., the engineering arm of The Southern Company, a multi-state investor-owned electric utility, proposed four of the winning projects. American Electric Power Service Corp., a subsidiary of American Electric Power Company, Inc., also a multi-state investor-owned electric utility, proposed the largest single project that was selected for funding. Other successful proposers include Southwestern Public Service Co., an investor-owned electric utility based in Amarillo, Texas; Combustion Engineering, which was selected for three projects; the Passamaquoddy Indian Tribe of Main; Babcock & Wilcox Co., which was chosen for two projects; Bethlehem Steel; Pure Air, a joint venture of Air Products and Chemicals, Inc., and Mitsubishi Heavy Industries America, Inc.; Otisca Industries; and TransAlta Resources Investment

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*As featured in Spring 1988 issue of Electric Perspectives.

Proposer	Project	Site
Southern Company Services, Inc. Birmingham, AL	Demonstration of the Chiyoda Thoroughbred-121 Flue Gas Desulfurization Process	Plant Yates Newnan near Atlanta, Georgia
Southern Company Services, Inc. Birmingham, AL	Advanced Wall-Fired Combustion Techniques for Reduction of Nitrogen Oxides	Plant Hammond Coosa near Rome, Georgia
Southern Company Services, Inc. Birmingham, AL	Selective Catalytic Reduction Technology for Control of Nitrogen Oxides	Plant Crist Pensacola Escambia County, Florida
Southern Company Services, Inc. Birmingham, AL	Advanced Tangentially Fired Combustion Techniques for Reduction of Nitrogen Oxides	Plant Smith Lynn Haven near Panama City, Florida
Combustion Engineering, Inc. Windsor, CT	Post-Combustion Dry Sorbent Injection Technology Demonstration	Yorktown, Virginia
Combustion Engineering, Inc. Windsor, CT	Innovative Clean Coal Gasification Repowering Project	Springfield, Illinois
Combustion Engineering, Inc., & Snamprogetti USA, Inc. Windsor, CT	WSA-SNOX Technology for Catalytically Reducing Sulfur Dioxide and Nitrogen Oxides from Flue Gas	Niles, Ohio
The Babcock & Wilcox Company Alliance, OH	Demonstration of the SOX-NOX-ROX Box Post-Combustion Flue Gas Cleanup Process	Dilles Bottom, Ohio
The Babcock & Wilcox Company Alliance, OH	Coal Reburning for Cyclone Boiler Nitrogen Oxide Control	Cassville, Wisconsin
Southwestern Public Service Company Amarillo, TX	Circulating Fluidized Bed Repowering Project	Amarillo, TX
Passamaquoddy Tribe Thomaston, ME	Innovative Sulfur Dioxide Scrubbing System for Coal-Burning Cement Kilns	Thomaston, Maine
American Electric Power Service Corp. Columbus, OH	Pressurized Fluidized Bed Combustion Repowering Project	New Haven, West Virginia
Bethlehem Steel Corporation Bethlehem, PA	Innovative Coke Oven Gas Cleaning	Baltimore County, Maryland
Pure Air Allentown, PA	Advanced On-Site Flue Gas Desulfurization Process	Gary, Indiana
TransAlta Resources Investment Corp. Calgary, Alberta Canada	Low Nitrogen Oxide/Sulfur Dioxide Burner Retrofit for Utility Cyclone Boilers	Marion, Illinois
Otisca Industries, Ltd. Syracuse, NY	Production of Compliance OTISCA FUEL (Coal Water Slurry) and Its Combustion in Retrofitted Industrial Boilers	Syracuse, New York Jamesville, New York Oneida, New York

Corp., a subsidiary of TransAlta Utilities Corp., an investor-owned electric utility in Canada, for a project located in Illinois.

The Electric Power Research Institute, the research arm of the utility industry, was identified as a cosponsor or participant in 8 of the 16 selected projects.

The winners were chosen from 55 proposals submitted last May. More than 100 technical experts from the Energy Department and the Environmental Protection Agency, working under the direction of an eight-member evaluation board, reviewed the proposals.

The second round selection begins a period of simultaneous negotiations between the Energy Department and the successful proposers. Negotiations are expected to be complete by March, and the department should begin soliciting proposals for the third round of awards by May.

REGULATORY REVIEW

PROPOSED REVISIONS TO EIA FORM 714 COULD SAVE MILLIONS ANNUALLY

Table 1
Paperwork Reduction Savings 1981–1988

Years	Annual Industry Direct Savings	Annual Industry Avoided Costs
1981–82	$ 8,429,940	$411,050,000
1983–84	$ 45,746,190	$140,755,100
1985–86	$ 39,550,000	$ 8,750,000
1987	$ 30,900,000	$ 18,785,000
1988 EST.	$ 20,500,000	$ 10,000,000

NOTE: Direct savings are related to the existing regulations at the time.

Avoided costs are related to government proposals not adopted.

The Energy Information Administration recently completed preliminary revisions to EIA Form 714, the "Annual Electric Power Systems Report" utilities are required to submit to the Department of Energy. Edison Electric Institute's Federal Paperwork Task Force, which initiated the proposed changes two and a half years ago, estimates the revisions could save the electric utility industry over $20.5 million annually.

EIA Form 714 is one of the hundreds of reports utilities must file regularly with various government agencies. Although it is not the most voluminous report required, it is a vital and extensively used federal document. The government uses the data in the report when considering wholesale rate cases, comparison testing, and future load requirements.

The proposed revisions are designed to allow companies to file data they already have in house without converting the information to fit an abstract form. In addition, the revisions eliminate many data requirements that are collected on other forms or are obsolete to current government needs.

According to Joseph O'Flaherty, former Chairman of the EEI Federal Paperwork Task Force and recently retired Manager of Governmental Regulatory Affairs at Northeast Utilities, before the changes are implemented, the final draft must be completed and approval must be gained from several other federal agencies, a process which is expected to be completed within the next few months.

The Task Force works to reduce the paperwork burden on utilities by reviewing existing and proposed reporting requirements and forms, developing and promoting proposals for change, testing draft forms, and documenting regulatory burdens. Working cooperatively with the government, the Task Force has saved the industry millions of dollars annually. (See Table 1.) Its goal is to ensure that federal reporting requirements yield meaningful understandable data on a consistent basis in a format that is the least burdensome to all parties involved. ■

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FINANCIAL REVIEW

SECOND QUARTER EARNINGS DOWN 19.4 PERCENT

Investor-owned electric utility earnings per share (EPS) before extraordinary items decreased 19.4 percent from $0.62 in the second quarter of 1987 to $0.50 in the second quarter of 1988. The decrease was caused chiefly by declining accruals for allowance for funds used during construction (AFUDC). Increased operating expenses, especially for companies that have recently completed construction of large generation facilities, and a 1.4 percent decline in electric operating income also worked to reduce earnings. (See Table 1.)

AFUDC dropped 43.5 percent from $1.34 billion in the second quarter of 1987 to $0.76 billion in the second quarter of 1988. The completion of plants, lower levels of construction, and the effect of one company shifting from accrual of AFUDC to interest capitalization all contributed to the decline in AFUDC. The accounting change by that one company caused AFUDC to be $15 million lower in the second quarter of 1988 than it was in the second quarter of 1987. AFUDC as a percentage of net income available for common declined from 37.0 percent for the year ending June 30, 1987, to 25.3 percent for the year ending June 30, 1988.

Electric operating expenses increased from $24.6 billion recorded in the second quarter of last year to $25.0 billion for the second quarter of this year, an increase of 1.5 percent. The rising expenses were experienced primarily by the 15 or so companies that have brought large generating units on line since the beginning of 1987. Those companies have not been able to accrue AFUDC related to investments, nor have they received a final rate decision on the investments. Consequently, despite increased expenses related to the assets, a compensating revenue stream or accrual has yet to be put in place.

Electric operating income declined 1.4 percent from $6.3 billion in the second quarter of 1987 to $6.2 billion in the same quarter of 1988 as revenue growth continues to lag sales growth. (See the Statistical Review, this issue.) Poor natural gas sales caused a 5.7 percent decrease in other utility operating income from $224 million to $221 million. The combined effect was a 1.5 percent decrease in total utility operating income.

Phase-in plan accruals as a percentage of net income available for common rose from the 12.4 percent recorded in the second quarter of 1987 to 16.7 percent in the second quarter of 1988. The aggregate amount of phase-in accruals has increased each quarter since EEI began tabulating them in the first quarter of 1987. The apparent leveling of the trend from the first ($539 million) to the second ($540 million) quarter of 1988 is due more to the number of pending rate cases concerning the treatment of nuclear generation plants than to an actual slowing of the trend.

Other income and deductions decreased 25.0 percent from $478 million in the second quarter of last year to $359 million for the second quarter of 1988. This decrease was primarily due to two factors. First, many companies' non-utility operations did not impact the earnings trend during the second quarter of 1988. Second, one company recorded a $179 million after-tax write-off related to a canceled plant.

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Table 1

Investor-Owned Electric Utility Industry Statement of Income

(Millions of Dollars)

	Three Months Ending June 30,			Twelve Months Ending June 30,		
	1988	1987r	% Change[3]	1988	1987r	% Change[3]
Total Electric Operating Revenues[1]	$31,207	$30,933	0.9	$131,944	$128,261	2.9
Electric Operating Expenses						
Fuel	$ 7,335	$ 7,485	(2.0)	$ 31,450	$ 31,227	0.7
Other Operation & Maintenance	10,267	9,343	9.9	40,712	36,910	10.3
Depreciation & Amortization	3,507	3,133	11.9	13,599	12,063	12.7
Costs Deferred Under Rate Phase-In Plans	(292)	(277)	5.3	(1,107)	(978)	13.1
Taxes Other Than Income Taxes	2,554	2,436	4.8	10,291	9,758	5.5
Income Taxes: Federal & Other	1,046	1,257	(16.8)	6,354	6,882	(7.7)
Deferred Income Taxes	616	1,219	(49.4)	2,779	5,105	(45.6)
Investment Tax Credits, Net	(24)	51	N.M.	204	446	(54.4)
Total Electric Operating Expenses	$25,008	$24,648	1.5	$104,281	$101,412	2.8
Electric Operating Income	$ 6,199	$ 6,284	(1.4)	$ 27,663	$ 26,849	3.0
Other Utility Operating Income	211	224	(5.7)	1,149	1,213	(5.3)
Total Utility Operating Income	$ 6,410	$ 6,508	(1.5)	$ 28,812	$28,061	2.7
Other Income & Deductions—Net	359	478	(25.0)	507	1,121	(54.8)
Phase-in Deferrals	248	213	16.1	951	707	34.5
Allowance for Other Funds Used During Construction	388	785	(50.6)	2,123	3,687	(42.4)
Total Income Before Interest Charges	$ 7,405	$ 7,985	(7.3)	$ 32,393	$ 33,576	(3.5)
Interest Charges						
Interest on Long-Term Debt	$ 3,706	$ 3,718	(0.3)	$ 14,681	$ 14,824	(1.0)
Other Interest Expenses & Charges	272	246	10.6	907	961	(5.7)
Allowance for Borrowed Funds Used During Construction	(367)	(553)	(33.5)	(1,586)	(2,210)	(28.2)
Net Interest Expenses & Charges	$ 3,610	$ 3,411	5.9	$ 14,002	$ 13,576	3.1
Net Income Before Extraordinary Items	$ 3,794	$ 4,574	(17.1)	$ 18,391	$ 20,001	(8.0)
Extraordinary Items	0	2	N.M.	51	(371)	N.M.
Cumulative Effect of a change in accounting principle[4]	0	0	N.M.	(1,455)	(1,077)	35.0
Net Income	$ 3,794	$ 4,576	(17.1)	$ 16,988	$ 18,553	(8.4)
Preferred Dividends Declared	563	614	(8.4)	2,305	2,604	(11.5)
Net Income Available for Common	$ 3,232	$ 3,962	(18.4)	$ 14,683	$ 15,949	(7.9)
Common Dividends Declared	3,186	3,182	0.1	12,772	12,561	1.7
Additions to Retained Earnings	$ 46	$ 780	(94.1)	$ 1,911	$ 3,387	(43.6)
Avg. Shares Outstanding[2]	6,484	6,376	1.7	6,461	6,344	1.9
Earnings Per Share Before Extraordinary Items and the Cumulative Effect of a change in accounting principle[2]	$0.50	$0.62	(19.4)	$2.49	$2.74	(9.1)
Earnings Per Share After Extraordinary Items and the Cumulative Effect of a change in accounting principle[2]	$0.50	$0.62	(19.4)	$2.27	$2.51	(9.6)
Common Dividends Per Share[2]	$0.49	$0.50	(2.0)	$1.98	$1.98	0.0

SOURCE: EEI Survey Data and Standard and Poors Compustat II Database Service

[1] Revenues are adjusted for intra-industry sales for resale of electricity.

[2] Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.

[3] Percent changes may reflect roundings.

[4] Totals reflect 1988 and 1987 first and second quarter data only.

r—Revised to reflect company restatements.

N.M.—Not Meaningful.

Exclusion of that non-recurring item would reduce the decline in EPS before extraordinary items from 19.4 to 14.5 percent.

Common dividends per share for the year ending June 30, 1988, showed no growth, equalling the $1.98 recorded for the year ending June 30, 1987. The dividend payout ratio (after extraordinary items) of 87.0 percent for the twelve-month period was up from the 78.8 percent recorded for the same period one year earlier. The increase is attributable to the year's declining earnings growth coupled with the negligible percentage change in the amount of dividends paid over the period.

The electric utility industry's earned return on average common equity (ROE) declined to 11.5 percent, continuing the downward trend experienced since earned ROE peaked at 15.3 percent at the end of the second quarter of 1984. The change in ROE reflects lowered earnings, the increase in average common equity, and the downward trend in allowed returns authorized by commissions.

The industry's balance sheet continues to improve as construction work in progress (CWIP) decreased from $67.7 billion as of June 30, 1987, to $43.7 billion as of June 30, 1988. CWIP as a percentage of net plant in service dropped from 23.2 percent to 13.6 percent during the same period. Associated with the decrease in CWIP were increases in total utility plant of 10.5 percent and accumulated depreciation of 11.2 percent. (See Table 2.)

Total capitalization for the industry rose 2.1 percent, representing an increase of $6.7 billion over the year ending June 30, 1987. Contributing to the rise in capitalization were increases in both common equity of 2.2 percent and long-term debt of 2.8 percent. The common equity capitalization ratio increased from 42.7 percent to 42.9 percent. Total common equity grew although there was a significant drop in the percentage growth rate of retained earnings. The growth rate of retained earnings has now declined for seven consecutive quarters. The increase of the industry's total capitalization was partially offset by a decrease in preferred stock, which, as a percentage of total capitalization, decreased from the 8.5 percent recorded as of June 30, 1987, to 8.0 percent as of June 30, 1988.

Investments for the industry increased 18.6 percent to $18.5 billion, up from the $15.6 billion recorded June 30, 1987. The increase represents, in many cases, the recording of subsidiary operations of holding companies, reflecting a change in EEI's data collection methodology initiated in the first quarter of 1988.

Note also that the EPS decrease is lower than the EPS percentage drop reported by others. EEI methodology is to include in EPS figures the effects of non-recurring items such as accounting changes and asset write-offs. The relatively high incidence of write-offs, asset sales, and accounting changes during 1987 and 1988 has led to a pronounced gap between EEI's and others' EPS figures.

Tables 1 and 2 are based on unaudited reports submitted by a sample of investor-owned electric utilities. The sample represents approximately 94.5 percent of the investor-owned electric utility industry's total assets and 97.5 percent of its total revenues. With Standard & Poor's Utility Compustat II database, the sample data are adjusted to represent the entire investor-owned electric utility industry. The 1987 data also have been revised to reflect all company restatements.

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Table 2

Investor-Owned Electric Utility Industry Balance Sheet

(Millions of Dollars)

Assets	**June 30, 1988**	**June 30, 1987r**	**Percent Change**[3]
Utility Plant[1]			
Utility Plant (Including Nuclear Fuel)	$446,537	$404,267	10.5
Less Accumulated Depreciation	125,104	112,522	11.2
Total	$321,433	$291,745	10.2
Construction Work in Progress	43,754	67,702	(35.4)
Net Utility Plant	$365,187	$359,447	1.6
Investments	18,545	15,632	18.6
Current Assets	39,380	39,765	(1.0)
Deferred Debits	28,949	23,906	21.1
Total Assets	$452,062	$438,750	3.0
Capitalization & Liabilities			
Capitalization			
Common Stock	$ 91,456	$ 89,510	2.2
Retained Earnings	50,771	49,354	2.9
Preferred Stock	26,664	27,716	(3.8)
Long-Term Debt	162,675	158,264	2.8
Total Capitalization	$331,566	$324,843	2.1
Current Liabilities			
Short-Term Debt	$ 9,367	$ 8,966	4.5
Long-Term Debt Due Currently	4,789	5,224	(8.3)
Other Current Liabilities	28,451	28,975	(1.8)
Total Current Liabilities	$ 42,607	$ 43,164	(1.3)
Deferred Credits			
Capital Lease Obligations, Non-Current Portion	$ 4,624	$ 5,011	(7.7)
Accumulated Deferred Income Taxes[2]	43,568	39,583	10.1
Accumulated Deferred Investment Tax Credits	16,911	16,721	1.1
Other Deferred Credits	12,787	9,428	35.6
Total Deferred Credits	$ 77,890	$ 70,743	10.1
Total Capitalization & Liabilities	$452,062	$438,750	3.0

SOURCE: EEI Survey Data and Standard and Poors Compustat II Database Service

[1] Includes non-electric utility plant.

[2] Includes property-related deferred income taxes.

[3] Percent changes may reflect roundings.

r—EEI changed its reporting methodology so that property-related deferred income taxes are now entered as a liability rather than a reduction to plant. Data for 1987 also have been revised to reflect company restatements.

STATISTICAL REVIEW

SECOND QUARTER SALES UP 2.4 PERCENT

Electricity sales to ultimate customers by investor-owned electric utilities during the second quarter of 1988 totaled 457.2 million megawatthours (MWh), up 10.7 million MWh over 1987's second quarter total of 446.5 million MWh. (See Table 1.)

Associated with the 2.4 percent increase in sales were a modest 1.2 percent rise in total revenues and a very typical 2.0 percent increase in the number of customers. (Since EEI began to track quarterly data in 1981, the average number of ultimate customers served by investor-owned electric utilities has grown steadily at about 2.0 percent each quarter over the same quarter of the previous year.)

Most of the moderation in sales growth from the first quarter's strong 6.8 percent increase can be attributed to weather. While higher than normal temperatures helped boost air conditioning loads during the second quarter of last year, this year cooler than normal weather helped dampen that demand, especially in the residential sector. Residential sales increased by only 0.1 percent despite a 1.9 percent increase in the average number of customers.

In contrast, continued strong economic growth more than offset the weather's impact on commercial and industrial sales, which grew by 3.8 and 3.4 percent, respectively, over the same quarter a year ago. Industrial activity as measured by the Federal Reserve Board Index of Production rose a healthy 6.0 percent.

The commercial class experienced the largest increase in sales, as it generally has for the last two years, averaging a 4.8 percent quarterly increase over that period. Industrial sales for the quarter were

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Table 1
Second Quarter Customers, Sales, and Revenue Data for Investor-Owned Electric Utilities

	Three Months Ended June 30,			Twelve Months Ended June 30,		
	1988	1987	% Change	1988	1987	% Change
Number of Customers (Average)						
Residential	71,267,362	69,936,300	1.9	70,788,237	69,498,275	1.9
Commercial	8,867,461	8,638,135	2.7	8,792,626	8,550,797	2.8
Industrial	366,341	369,807	(0.9)	370,463	369,129	0.4
Street & Highway	130,010	126,366	2.9	128,806	124,856	3.2
Other Public Authorities	150,077	145,895	2.9	148,760	145,429	2.3
Railroads	22	21	4.8	21	21	0.0
Interdepartmental	448	439	2.1	435	441	(1.4)
Total Customers	80,781,721	79,216,963	2.0	80,229,348	78,688,948	2.0
Electricity Sales (MWh)						
Residential	136,690,151	136,556,774	0.1	629,827,157	606,630,833	3.8
Commercial	136,082,701	131,057,560	3.8	557,953,300	529,870,926	5.3
Industrial	170,396,975	164,802,636	3.4	675,313,837	642,899,536	5.0
Street & Highway	2,421,412	2,391,573	1.2	10,384,610	10,369,393	0.1
Other Public Authorities	10,597,517	10,521,010	0.7	43,887,016	42,691,205	2.8
Railroads	572,962	539,380	6.2	2,296,507	2,247,064	2.2
Interdepartmental	412,025	622,419	(33.8)	1,753,162	2,622,865	(33.2)
Total Sales	457,173,743	446,491,352	2.4	1,921,415,589	1,837,331,822	4.6
Revenues ($000)						
Residential	10,822,967	10,749,203	0.7	48,735,953	46,859,359	4.0
Commercial	9,766,381	9,482,942	3.0	40,042,517	38,513,036	4.0
Industrial	8,044,399	8,027,002	0.2	32,453,205	32,018,452	1.4
Street & Highway	294,781	308,945	(4.6)	1,182,927	1,194,482	(1.0)
Other Public Authorities	567,477	568,424	(0.2)	2,339,406	2,310,063	1.3
Railroads	36,179	36,243	(0.2)	143,946	151,028	(4.7)
Interdepartmental	26,440	38,900	(32.0)	113,184	159,736	(29.1)
Total Revenues	29,558,623	29,211,659	1.2	125,011,138	121,206,156	3.1

SOURCE: Edison Electric Institute, Statistics Department

also strong, especially in light of the 0.9 percent reduction in the number of industrial customers.

Following a trend that began during the fourth quarter of 1986, revenue growth continued to lag behind sales growth for both the three-month and twelve-month comparisons. The trend is attributed primarily to the innovative pricing structures that a number of utilities are using to increase their competitiveness, to rate reductions related to the 1986 Tax Reform act, and to reductions in allowed returns on equity.

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Illinois Stock Transfer Company 3
Interaction Associates 40
Leeds & Northrup Systems . . . . . . Cover 3
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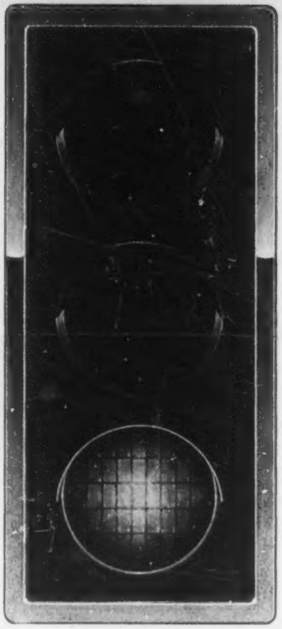

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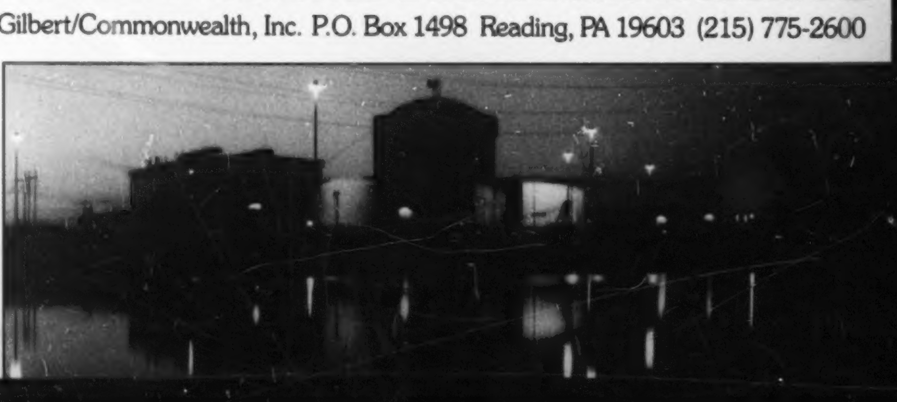

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CONTENTS

ELECTRIC PERSPECTIVES EP **MARCH–APRIL 1989**

ELECTRICITY FUTURES: AMERICA'S ECONOMIC IMPERATIVE

8

Electricity will continue to play a critical role in the nation's future economic expansion according to a comprehensive report by Edison Electric Institute.

MERGERS AND ACQUISITIONS

22

Although not the inevitability some observers claim, mergers and acquisitions can be a valuable strategic option for some utilities, if pursued wisely.

By William E. Wall

CONSUMER PERCEPTIONS ABOUT THE GROUND SOURCE HEAT PUMP

28

Focus group discussions among recent purchasers of residential heating and air conditioning systems provide rich insight for utilities seeking to encourage the adoption of GSHPs.

By Bruce F. Roberson, Richard O. Weijo, and Mark P. Hattrup

REVIEWS

FINANCIAL REVIEW 39

STATISTICAL REVIEW 43

TECHNOLOGY REVIEW 45

REGULATORY REVIEW 46

Cover: Electricity's role in the economy from now to 2015, p.8. Photo by Nichel Tcherevkoff/The Image Bank.

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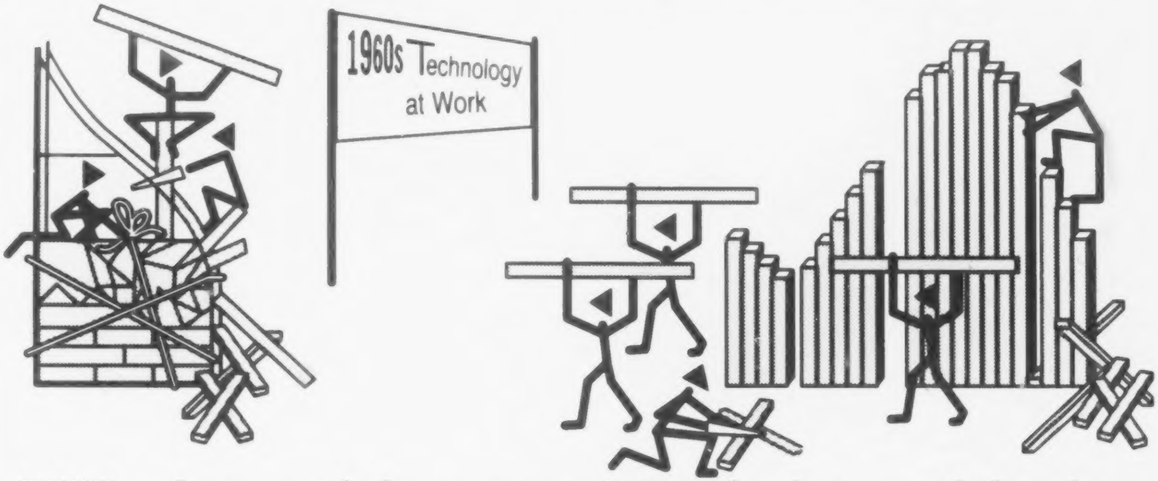

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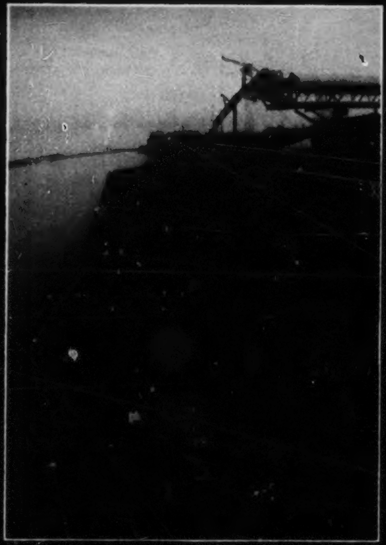

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Electricity Futures: America's Economic Imperative

Electricity will continue to play a critical role in the nation's future economic expansion according to a comprehensive report by Edison Electric Institute.

Ten years ago the United States was in the midst of an economic struggle precipitated by turmoil in energy markets. Overall energy use declined in response to the combined forces of higher prices and energy policy. Although the trend toward increased electricity use never was similarly reversed, growth was tempered. By 1980, electricity usage was expanding by only two percent per year and headed even lower, in close parallel with Gross National Product (GNP). In 1982, total electricity usage actually declined. Consequently, many utilities revised their forecasts and stretched out and scaled down construction schedules.

Now, in the late 1980s, a robust upswing is once again playing havoc with conventional wisdom. The vigor of the current business expansion, the resurgence of U.S. manufacturing industries in the wake of a more competitive dollar, sustained household formation, and consumer choices for comfort and convenience have raised electricity consumption to new, unanticipated heights.

These recent developments raise important questions for the electric utility industry. Most importantly, what long-run wisdom can be divined from both the recent strength and the competing forces affecting future electricity growth? The Edison Electric Institute's Electricity Futures Project has begun to address this question through exploration of a scenario that represents the playing out of a number of forces which will shape the social, economic, and energy future of the United States. The Project's findings are highlighted in the following pages.

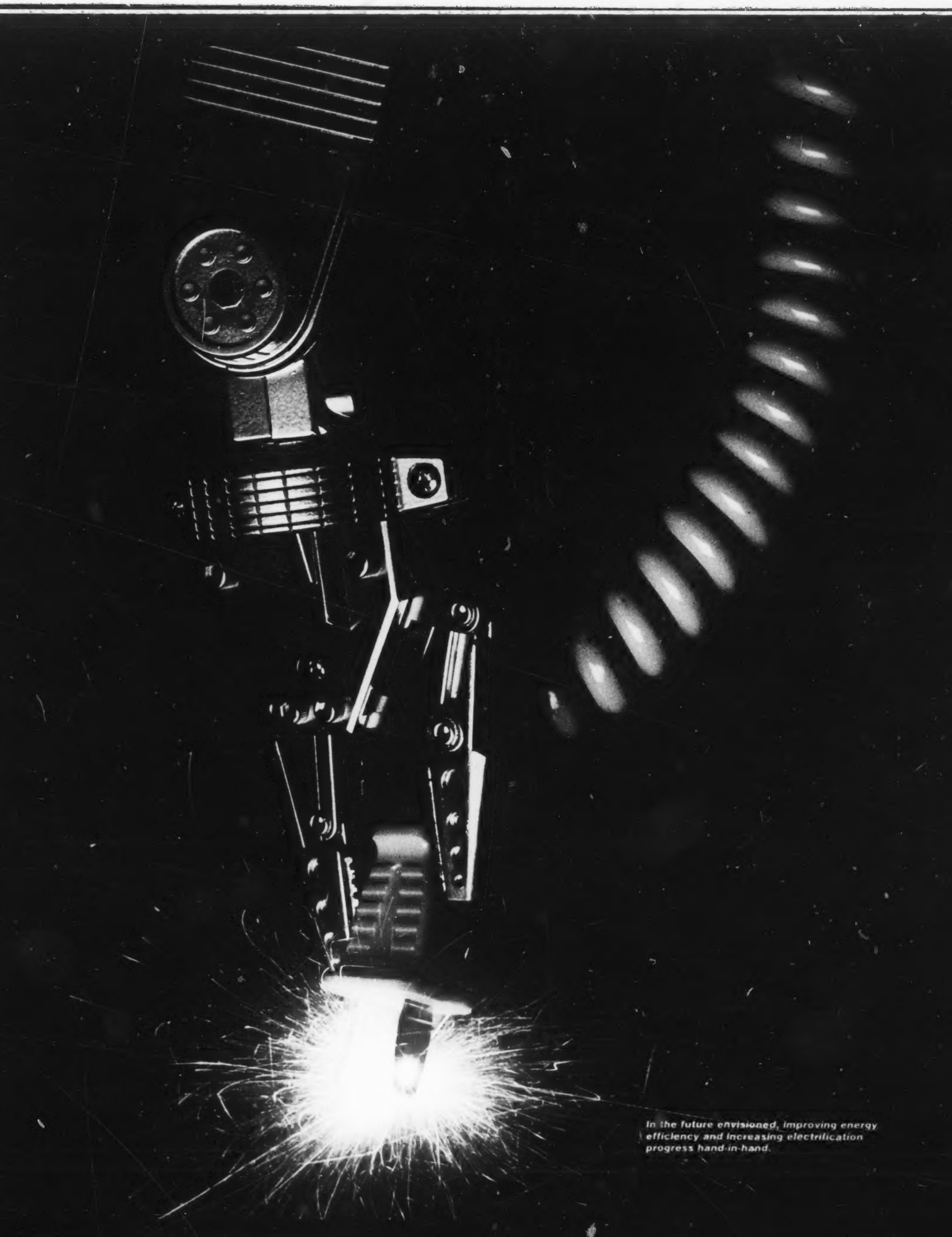
The Electricity Futures Project is conducted under the sponsorship of Edison Electric Institute and directed by the EEI Strategic Planning Department and the EEI Economics Committee. EEI gratefully acknowledges the contributions of the Electric Power Research Institute, the North American Electric Reliability Council, the Battlelle Memorial Institute, the Strategic Decisions Group, and, especially, the Futures Group. The Executive Summary, reprinted here, highlights the Project's findings, which are more fully explored in a book scheduled for publication in early 1989.

The economic future envisioned by the scenario is vibrant, with gross domestic product per capita and labor productivity growing faster than in the recent past. Commercial and industrial growth, increasingly reliant on electricity, will be healthy in a world of vigorous international competition and rapidly changing technology. Overall GNP growth will slow somewhat, from 2.7 percent per year for the fifteen years preceding 1987, to 2.5 percent per year for the period 1987 to 2000, and to 2.1 percent from 2000 to 2015. This reflects, in part, the slowing rates of growth of the population and the labor force over the next several decades.

The close tracking of electricity and real GNP growth rates, so evident since the mid-1970s, will persist through the year 2000, but with electricity growth of 2.6 percent slightly above GNP growth. Beyond 2000, however, the relationship can be expected to change under the influence of higher electricity prices, improving end-use efficiency, and structural changes in the composition of the U.S. economy. Despite slowing electricity growth, the share of electricity in the nation's energy profile will continue to expand. The future is one in which improving energy efficiency and greater electrification will continue hand-in-hand. In short, electricity will become increasingly imperative to the nation's economy. (See Figure 1.)

The scenario described in the following pages is not destiny, however. The future that does emerge will undoubtedly be affected by economic, political, demographic, and technological events and choices which we have failed to anticipate. Nevertheless, the forces at work are powerful and have potential implications which demand attention.

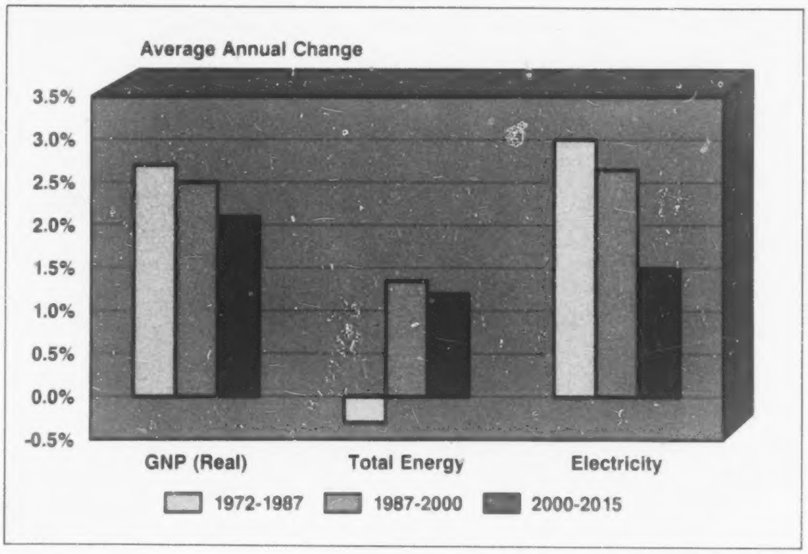
The character and direction of



In the future envisioned, improving energy efficiency and increasing electrification progress hand-in-hand.

Figure 1

Comparative Growth Trends



American society and business are in the midst of profound changes that will determine the nation's demand for energy. Future shifts in the nation's socioeconomic landscape—in population demographics, consumer preferences, the imperatives of the economy, energy prices, technology, and public policy—are certain to have marked effects on the amount and types of energy consumed, including electricity requirements.

Changing Demographics of the Population

By the year 2015, the demographic make-up of America will look very different. The population will be larger, older, more ethnically diverse, more cosmopolitan, and settling more in the West and South. The combination of trends in fertility, mortality, and immigration are largely behind this evolution.

Fertility rates have been declining in the U.S. for some time. Since 1972, the rate has tracked below the required replacement rate of 2.1 children per family. The movement of women into the labor force and the parallel postponement of childbearing continue to be powerful forces reinforcing this trend. Over the next several decades, it is not very likely that the U.S.'s overall fertility rate will rise much beyond the replacement level.

Impressive declines in mortality have been experienced in the past 25 years as greater emphasis has been placed on health-preserving lifestyles and medical capabilities have expanded. Life expectancy has been rising, with that for males now moving beyond 70 years and that for women soon to pass the 80 year mark. New entrants to the nation from abroad constitute a particularly volatile component of population growth. Current law and public policy are accommodating a flow of immigrants at levels not seen since the Great Depression—and that does not count the number of illegal entrants. The predominant youth and higher fertility rates of the present immigrant groups represents an important new factor in the nation's demographic picture.

Together, the trends in fertility, mortality, and immigration indicate that the U.S. population will be larger 25 years from now and that the rate of growth will be slower than in the past. There is, though, significant uncertainty about the magnitude of growth. The expectation is for a U.S. population in 2015 of around 290 million some 20 percent larger than the present 243 million. Plausible alternative forecasts, however, yield population estimates ranging from five to thirty-five percent more people than present, or between 264 million and 326 million. (See Figure 2.)

Uncertainties about future immigration are particularly influential in these projections. Other demographic characteristics are more predictable: Older-age groups will become more proportionally predominant, the combined result of low fertility and declining mortality. This will become more apparent as the turn of the century approaches. The middle-aged working population will make up a much larger share of the total; those 65 and older a larger share; and the young and school-aged groups a smaller share. (See Figure 3.)

Ethnic diversity of the population will increase, with present minorities and immigrants having, on average, higher fertility rates. Blacks, Hispanics, and Asians currently account for less than 23 percent of the population; this will likely reach 28 percent by 2000 and higher by 2015.

Growth in the U.S. population will continue to move to the less-densely settled, warmer South and

INTENTIONAL
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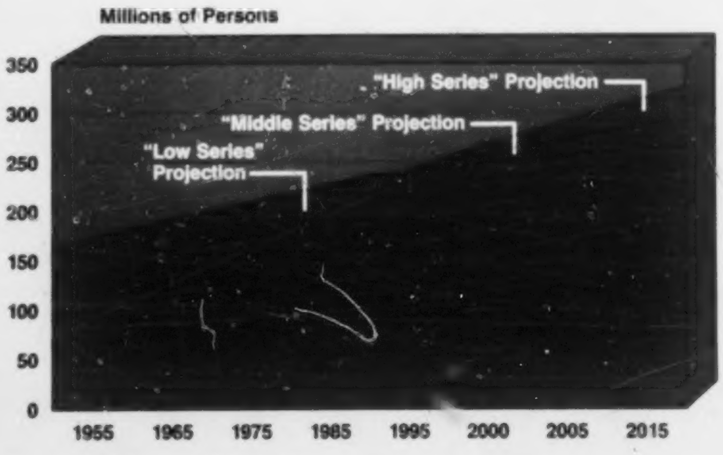
Figure 2

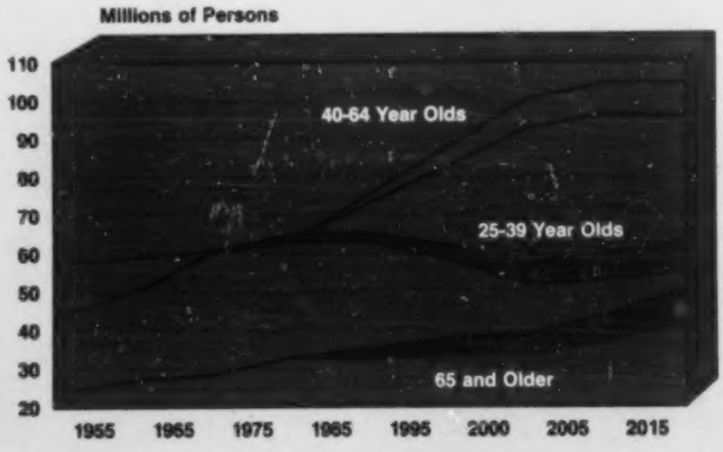
Future U.S. Population Growth



Source: U.S. Bureau of the Census

Figure 3

Forecasted U.S. Population



Source: U.S. Department of Commerce, Bureau of the Census

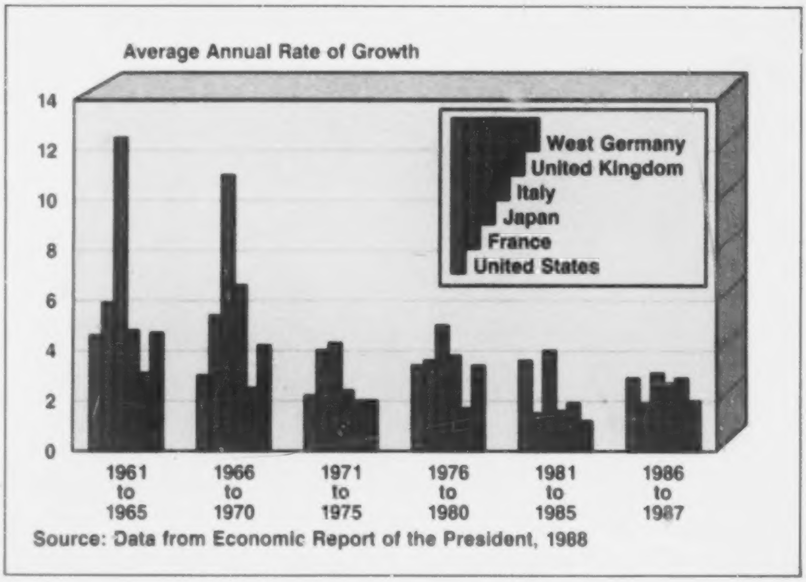
West, away from the older urban areas of the Northeast and the more rural Midwest. The internal movement of populations, however, is sensitive to changes in economic opportunities between regions.

Households will continue to be the basic social unit whose needs and lifestyles drive the economy. But the changes that have been occurring in family structure and living patterns—a decline in average family size, rapid rise of singles households with and without offspring, proportionate decline of conventional two-married adult households—have dramatically altered the lifestyles of U.S. households. Fewer than 15 percent now fit the "traditional" pattern of a family with two children and only the husband working. This "diversification" of households will persist and define a new pattern of the conventional. In addition, the household of the future promises to be technology-intensive. Householders can be expected to expand demand for a range of household services, convenience goods, and electronic and mechanical aids that will help them cope with a faster pace of life.

Finally, these changes will have direct impacts on the labor force. The rate of growth of the labor force will be slowing, particularly sharply after the turn of the century, and the work force as a whole will be getting older. A very large share, perhaps as much as 70 percent, of all new entrants by 2000 will be women. Minorities and immigrants will become increasingly important for the nation's labor supply. A window of opportunity will be opening for these groups in the economy in the years ahead; and one of the nation's most important immediate challenges will be to equip them with the knowledge and skills required by a rapidly changing job market.

Figure 4

International Comparisons



Source: Data from Economic Report of the President, 1988

The Future Economic Context

Economic progress in the 1990s and beyond will depend much on how public policy, national will, and business decisions act to balance both the positive and negative forces which mark the recent U.S. economic performance.

The business expansion since late 1982 has strengthened real growth in key areas such as economic output and income. Since 1981, the average annual rate of growth of Gross National Product (GNP) has matched or exceeded that of other major industrialized nations, except for Japan. (See Figure 4.) The U.S. continues to lead the world in job creation, since 1957 opening up more than 47 million new jobs across almost every segment of society (with Japan a distant second at 17 million). There also has been renewed growth in labor productivity in many sectors. (See Figure 5.)

Amidst these bright spots, however, there also are signs of significant weaknesses. Too much of the nation's economic growth since the early 1970s has come through increased numbers of workers and deterioration in real wages than through more efficient production. Real median family income essentially is no higher today than in the mid-1970s, and it would be much worse if it were not for the financial infusion provided by the rapid emergence of dual-income households. (See Figure 6.) The nation's economy also is confronted by major deficits in the federal budget and in international trade—both of which, in conjunction with other factors such as the nation's low rate of savings, create serious future risks for economic growth.

Four external forces will challenge the nation in the 1990s and into the Twenty-First Century: global integration, advancing technology, increasing competition, and the changing composition of output and employment.

Globalization: The global linking of markets for goods, services, technology, labor, and money and other financial services has been one of the most important developments of the post-war period. For the U.S., a truly domestic economy largely has ceased to exist. Some 70 percent of the goods produced by the nation's businesses compete directly with goods produced abroad. Imports and exports each account presently for about 10 percent of GNP.

Globalization will bring opportunity for U.S. businesses in the form of new markets. But it also will keep in place the rigors of greater competition. Business success will depend more and more on gaining and maintaining leading edges in global marketing, production, and distribution.

One particularly important side effect of this growing interdependence will be the nation's loss of a significant degree of sovereignty over its economic affairs, as will be true of other nations. A major challenge of the next several decades will be how the world's economic–powers can coordinate their economic policies and aspirations to mutual advantage.

Technology: The nation's future pace of economic growth will increasingly depend upon how rapidly and successfully it can adopt advances in science and technology. Technological change will pervade business operations, jobs, and lifestyles.

New technologies with the greatest significance for the economy in the 1990s will involve advanced materials, electronics, automation, computing, biotechnology, and medicine. This will be a world of widening opportunities to replace conventional metals and natural materials with a range of synthetics engineered to have unique high-performance properties; continuing improvements in computing and telecommunications; a growing host of microelectronic devices with intelligent capabilities; and many new diagnostic and therapeutic options in medicine.

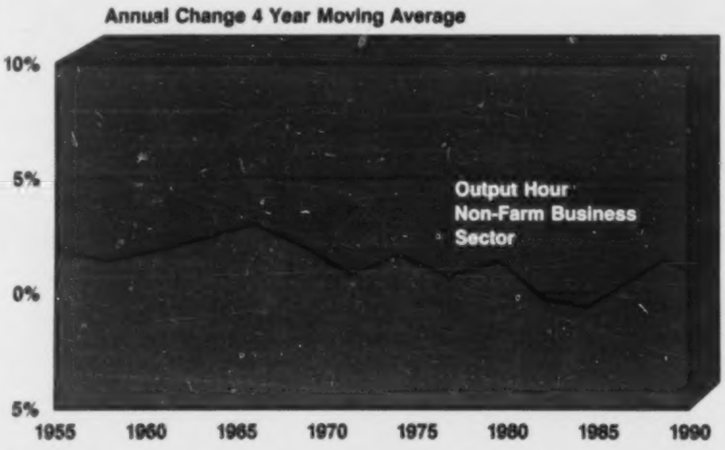
Much of the technology picture beyond 2000 is dependent on basic research breakthroughs yet to come. Other areas which could blossom to significant degrees include the industrialization of space, technologies exploiting superconductive materials, and energy systems such as photovoltaics, unconventional natural gas resources, and advanced nuclear technologies.

Competition: U.S. dominance of the world economy through the 1960s and early 1970s was based on overwhelming technological know-how and the ability to rapidly develop and commercialize new products and processes. But since the mid-1970s, most of this lead has eroded, with Japan, major nations of Europe, and newly-industrializing nations in Asia rapidly catching up and in some areas outdistancing the U.S.

The future evidences no respite. In manufacturing, business success will increasingly require harnessing leading edge competences in science and technology, capabilities for rapid innovation and product/process commercialization, and management that yields strong price and value competitiveness. Competition in services such as banking and finance, engineering and design, communications, information processing, health care, and education

Figure 5

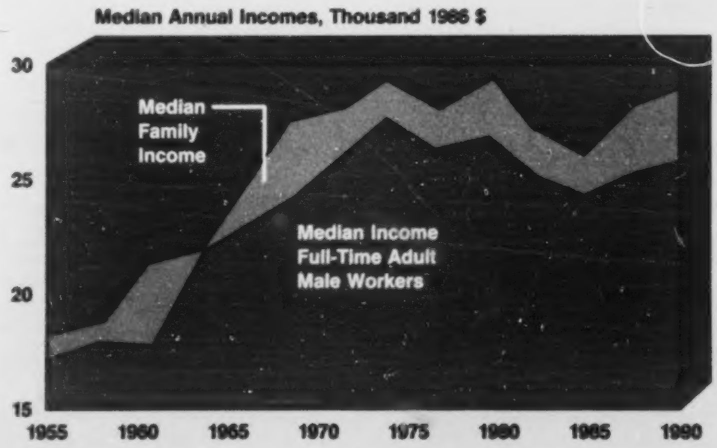
Trend in Growth of U.S. Productivity


Annual Change 4 Year Moving Average

Source: Data from Economic Report of the President, 1988

Figure 6

Trends in Income


Median Annual Incomes, Thousand 1986 $

Source: Data from the Economic Report of the President, 1988 has been much less intensive. But falling barriers around the world to trade in services, differences in labor costs, and emerging opportunities for technology-based advantages promise to escalate soon the competitive pressures in services, much as has happened already in manufacturing.

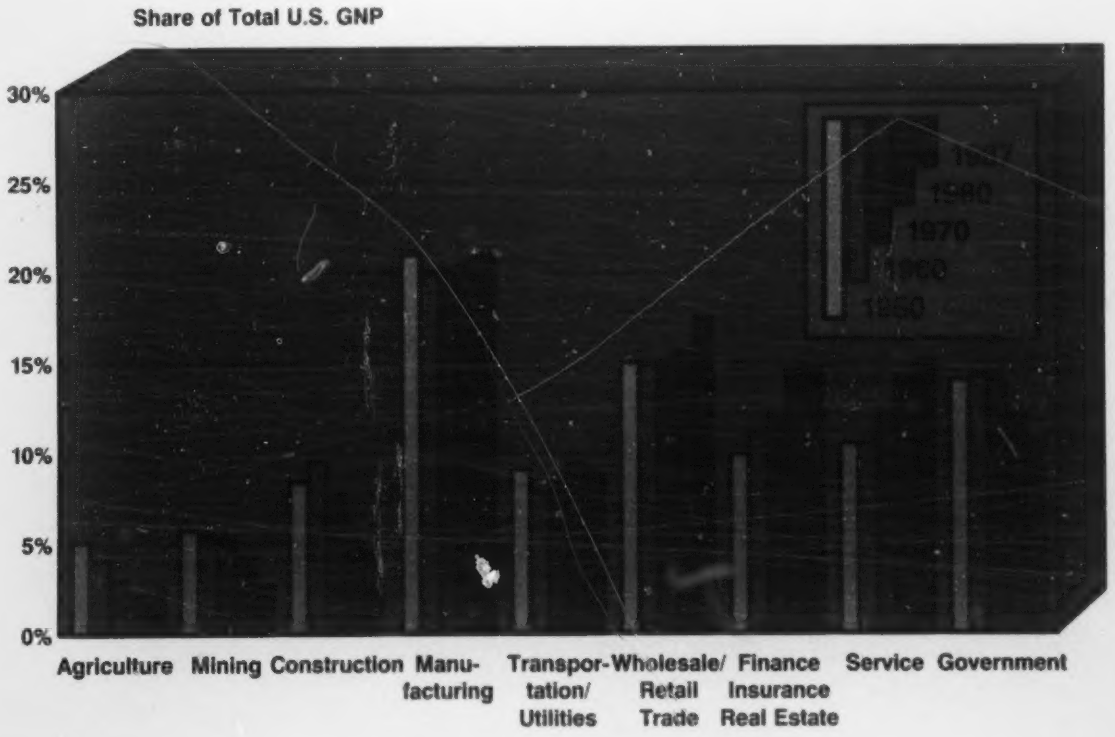
Composition of the Economy: Statistics tracing trends in economic structure over the last several decades provide evidence of important shifts in the composition of the economy. (See Figures 7 and 8.) The emergence of the much-talked about "services economy", however, is more persuasive from the perspective of employment than from the value of output.

The long-run stability of the manufacturing sector's share of total output has been one of the more enduring features of the nation's economic structure. In 1950, good-producing industries accounted for about 42 percent of GNP and service-producing industries 58 percent. Although by 1987 the share held by services had increased to 67 percent while that of goods-producing industries had declined to 33 percent, it is important to note that the decline of the goods-producing sector did not result from the decline of manufacturing but rather from declines in agriculture, mining, and construction.

Shifts in the economy's composition are sharper with respect to employment. In 1950, goods-producing industries accounted for 52 percent of all jobs; services accounted for 48 percent. By 1987, progressive declines in agricultural and manufacturing employment reduced the goods-producing industries' share of total employment to about 27

Figure 7

Trends in U.S. Output Composition



percent, while rapid and sustained employment growth in wholesale and retail trade, finance, other services, and government has driven the services-producing industries' share of employment to over 70 percent. Between 1975 and 1985, 10.7 million jobs were created in the U.S. outside agriculture; 68 percent of these were in wholesale and retail trade and other private sector services. Only five percent were in manufacturing and eight percent were in government. (See Table 1.)

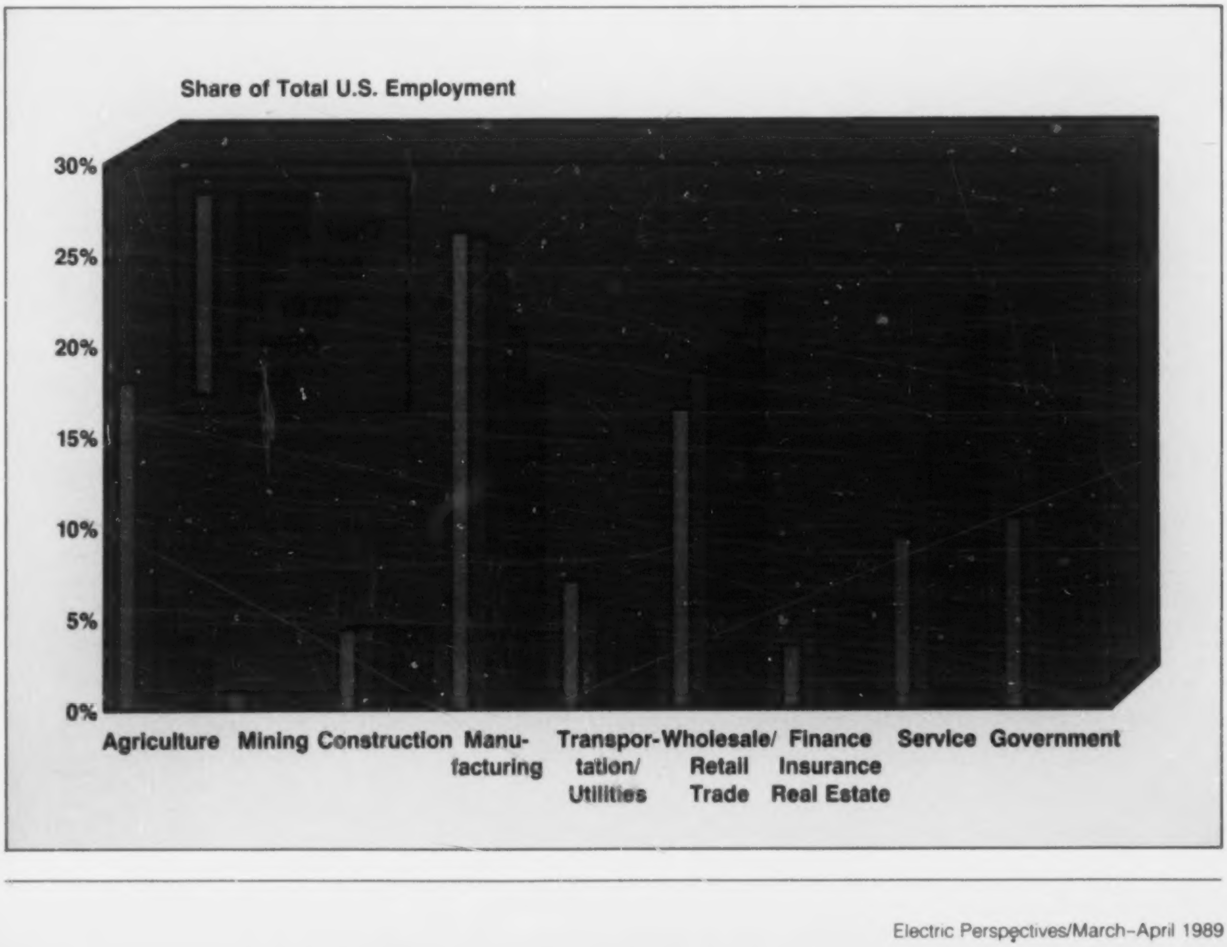
The national economy revealed in these trends is one in which, despite important shifts, there remains a strong dependency on the production of tangible goods. But employment, particularly new jobs, is increasingly driven by business sectors that provide services. The next 25 years should witness a continuation of these structural shifts. However, the intra-sectoral composition of manufacturing may change, with more growth expected in those segments that involve high-technology products and production processes and considerable customization, such as advanced machinery, electronic products, computers, communications equipment, and biotechnology.

The Changing Character of Business and Employment

In the years ahead, many of the nation's businesses will undertake significant adjustment to cope with their more complex and demanding environment. Many will be restructuring organizationally and financially to improve flexibility under rapidly changing market conditions. For most, relations with customers will take on new priority,

Figure 8

Trends in U.S. Employment Composition



both with regard to understanding evolving needs—and for post-sale support and service.

Advanced technology will become even more essential in many firms' competitive strategies. Much of U.S. manufacturing will be remade in light of the experiences of well-performing manufacturing firms that have demonstrated their competitive edge through careful attention to efficient production and aggressive adoption of process innovations. Increased automation such as robots and computer-based capabilities for product design and specialized production, as well as organizational innovations in the management of production, will increasingly find their way onto the shop floor.

Technology also will change service businesses. This already is well illustrated by the automated sorting and tracking systems which have been instrumental in the growth of private services for overnight mail and package delivery and the computer and telecommunications systems that have been major forces for change in wholesale and retail trade, engineering design, financial services, and travel. As the markets for services become more global and competition intensifies, such capabilities promise to provide a basis for many U.S. service-producing firms for improving productivity.

In the highly-competitive, information-intensive, and high-tech environment toward which we are moving, the work force will have a very different character. Traditional "hands on" workers and low-skilled laborers will be employed less and less in all but static or declining industries. Demand will grow for technical professionals, managers and support personnel, and workers in sales and marketing. More than half of these jobs will require some education beyond the secondary level and almost a third will be filled by college graduates. (See Table 2.)

Table 1

Sectoral Composition of New Jobs in the U.S. Economy

Sector	Period 1955–1965	1965–1975	1975–1985
Manufacturing	11.9%	1.9%	4.8%
Mining and construction	2.0%	2.5%	6.3%
Transportation and utilities	– 1.0%	3.1%	3.4%
Wholesale and retail trade	21.8%	26.5%	29.0%
Finance, insurance, and real estate	6.9%	7.4%	8.7%
Services	27.7%	30.2%	39.1%
Government	31.7%	28.4%	8.2%

NOTE: There were 10.1 million new jobs created during 1955–1965, 16.2 million during 1965–1975, and 20.7 million during 1975–1985. Percentages may not total 100 due to rounding.
SOURCE: National Academy of Science, 1987.

Table 2

Occupational Trends to the Year 2000

Education Required	Current Jobs	New Jobs
8 Years or Less	6%	4%
1–3 Years of High School	12%	10%
4 Years of High School	40%	35%
1–3 Years of College	20%	22%
4 Years of College or More	22%	30%
Median Years of School	12.8	13.5

SOURCE: Hudson Institute, 1987.

Future Requirements for Energy and Electricity

The Electricity Futures Project forecasts total use of electricity through the year 2000 to grow at an average annual rate around 2.6 percent, lower than the 3.0 percent average which prevailed in the 15 years from 1972 to 1987. In the 15 years after 2000, the Project forecasts a further slowing of growth in electricity use, to an average annual rate of 1.5 percent. Requirements for all end use energy, including electricity, are forecast to grow at an average annual rate of 1.3 percent through the year 2000 and then slow slightly to 1.1 percent annually through 2015. (See Figure 9 and Table 3.)

By 2015 the nation's economy is projected to require about 26 percent less total energy per real dollar of GNP. Over the same period, electricity's share of total end use energy is expected to grow significantly from about 17 percent in 1987 to over 20 percent in 2015.

The forecast presumes a moderate outlook on future economic growth: an average annual rate of GNP growth of 2.5 percent through 2000 and 2.1 percent annually from 2000 to 2015. It also presumes no major surprises in other domestic and international conditions; for example, no critical interruptions in the flow of international oil; no major changes in public policies affecting energy supplies or consumption; no economic or financial disruption significantly affecting the U.S. or its trading partners.

In short, the Electricity Futures Project foresees the next two-and-a-half decades as a period of improving overall energy efficiency but increasing electrification of the economy. Overall, the growth in requirements for electricity is expected to largely follow the rate of real GNP growth through the year 2000, as it has for much of the last 15 years. After 2000, however, growth in electricity requirements is expected to fall below the real GNP growth rate—the result of accumulating efficiencies in energy end use, shifts in demographics and the composition of the economy, and increasing competition from other fuels in some segments of energy markets.

The Project's forecast aggregates separate analyses of future trends in all the major energy consuming sectors.

Residential Sector

Overall consumption of both electricity and total end use energy by

Figure 9

End Use Energy—U.S. Total

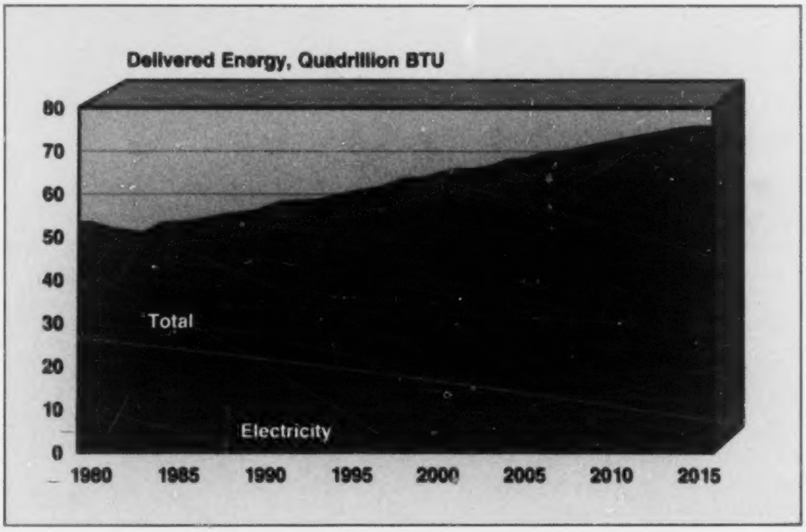


Table 3

Forecast Totals: Energy and Electricity for End Use

	1987	2000	2015
GROSS NATIONAL PRODUCT			
billion 1977$	2,505	3,462	4,754
avg ann growth rate, previous 15 years	2.7%	2.5%	2.1%
DELIVERED END USE ENERGY			
quadrillion Btu	54.8	64.8	76.5
avg ann growth rate, previous 15 years	−0.3%	1.3%	1.1
ELECTRICITY USE			
quadrillion Btu	9.1	12.6	15.6
billion kilowatt hours	2,516	3,500	4,334
avg ann growth rate, previous 15 years	3.0%	2.6%	1.5%
share of total end use energy	16.5%	19.4%	20.4%

NOTES: Totals include the requirements of the residential, commercial, industrial, and transportation sectors, plus the small "others" group. Electricity use includes both power purchased for end use and power generated by customers on-site for self use.

the nation's households will be modestly larger 25 years from now. But the rates at which these requirements grow will slow, from the 3.4 percent annual rate in 1972 to 2.0 percent annually from 1987 to 2000. The slowdown will be particularly sharp after 2000, with annual growth dropping to 1.0 percent. (See Figure 10 and Table 4.)

Part of this trend is due to the powerful effects of future demographic trends discussed earlier. The average annual rate of household formation in the U.S. is anticipated to significantly decline over the next 25 years. At the same time, the average household is expected to grow smaller in number of persons. Although this established trend may weaken toward the end of the forecast period, overall these forces will be slowing the rate of growth of the customer base for energy and electricity.

Improving energy efficiencies also is a major part of the story. By 2015, the average household is expected to consume some 22 percent less total energy annually. Substantial improvements in the thermal integrity of building envelopes will play a role in this, primarily in newly constructed homes but also in older homes retrofitted with weatherization measures stimulated by utility incentives and the prospect of long-term energy cost increases. Increasing adoption of energy-efficient appliances also will contribute, stemming from appliance efficiency standards mandated by public policy, the outlook for rising energy costs, and consumers' increasing attention to life-cycle cost considerations in appliance purchases.

Increasing penetration of sophisticated electronic devices for home management and other "space-age" appliances will create new require-

Figure 10

Energy Use in the Residential Sector

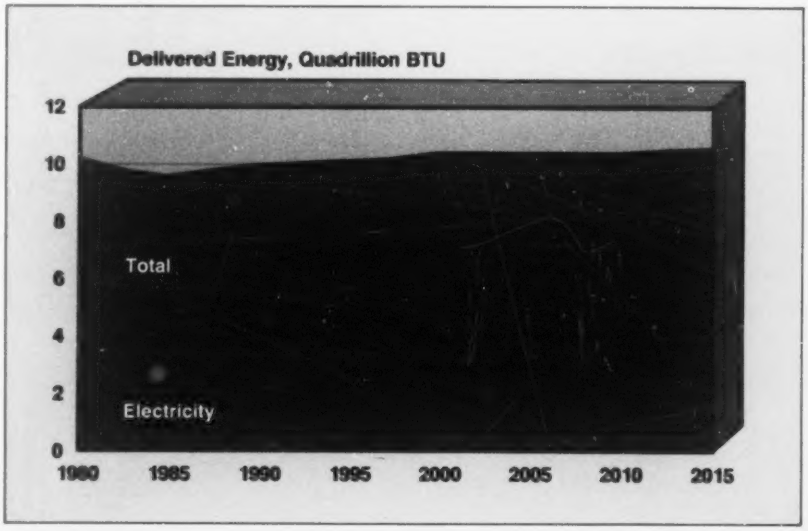


Table 4

Residential Sector: Energy and Electricity for End Use

	1987	2000	2015
NUMBER OF HOUSEHOLDS			
millions	90.4	110.2	124.0
avg ann growth rate, prev 15 years	2.1%	1.6%	0.8%
DELIVERED ENERGY TO END USE			
quadrillion BTUs	9.7	10.3	10.4
avg. ann growth rate, prev 15 years	−0.4%	0.4%	0.0%
ELECTRICITY USE			
quadrillion BTUs	3.0	3.9	4.2
avg ann growth rate, prev 15 years	3.4%	2.1%	0.4%
share of total end use energy	31.4%	38.0%	40.4%
ENERGY USE PER HOUSEHOLD			
million BTUs per household	107.3	93.8	83.6
ELECTRICITY USE PER HOUSEHOLD			
million BTUs per household	33.7	35.7	33.8

ments for electricity in the home. Population shifts favoring the South and West should increase the role of heat pumps for residential space heating and cooling.

Figure 11

Energy Use in the Commercial Sector

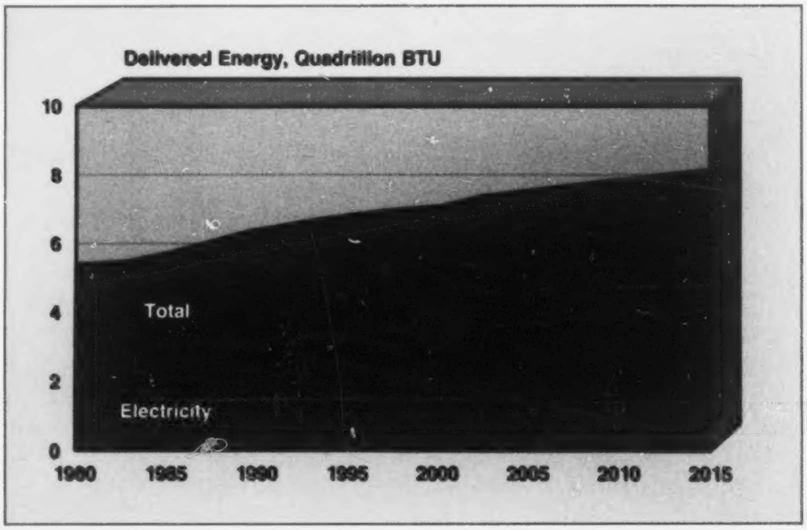


Table 5

Commercial Sector: Energy and Electricity for End Use

	1987	2000	2015
COMMERCIAL FLOORSPACE			
billions of square feet	55.9	71.8	85.0
avg ann growth rate, prev 15 years	1.3%	1.9%	1.1%
DELIVERED ENERGY TO END USE			
quadrillion Btu	6.0	7.2	8.2
avg ann growth rate, prev 15 years	0.6%	1.4%	0.9%
ELECTRICITY USE			
quadrillion Btu	2.4	3.4	4.0
avg ann growth rate, prev 15 years	4.1%	2.7%	1.0%
share of total end use energy	40.0%	47.5%	48.7%
ENERGY USE INTENSITY			
thousand Btus per square foot	108.1	100.4	96.6
ELECTRICITY USE INTENSITY			
thousand Btus per square foot	43.2	47.8	47.2

Commercial Sector

Consumption of electricity and total end use energy by the nation's commercial establishments will expand over the next 25 years. Average annual rates of growth for energy and electricity requirements should be well above those forecast for the residential sector. (See Figure 11 and Table 5.) In the future, contrasting paces of floor space expansion are anticipated for the numerous segments of this sector, although overall floor space growth will decline after 2000.

Important also is the strong economic force for improving efficiencies. Based on a composite of all commercial building types, average annual energy consumption per square foot is forecast to decrease more than 10 percent by 2015. Part of this results from better commercial building construction practices, and energy efficient retrofits stimulated in part by utility energy conservation and management programs.

The growth of commercial sector electricity requirements is forecast to significantly outpace that for all end use energy in the sector through 2000, but slow to about the same rate in the 15 years after 2000. Over the next decade, electricity will benefit from stable prices in competitive segments of the market, such as space heating and cooling, and from ongoing penetration of end use applications uniquely suited to electricity, such as computers. The slowing of growth in the past-2000 period reflects accumulating efficiency improvements, strengthening of competition from

Figure 12

Energy Use in the Industrial Sector

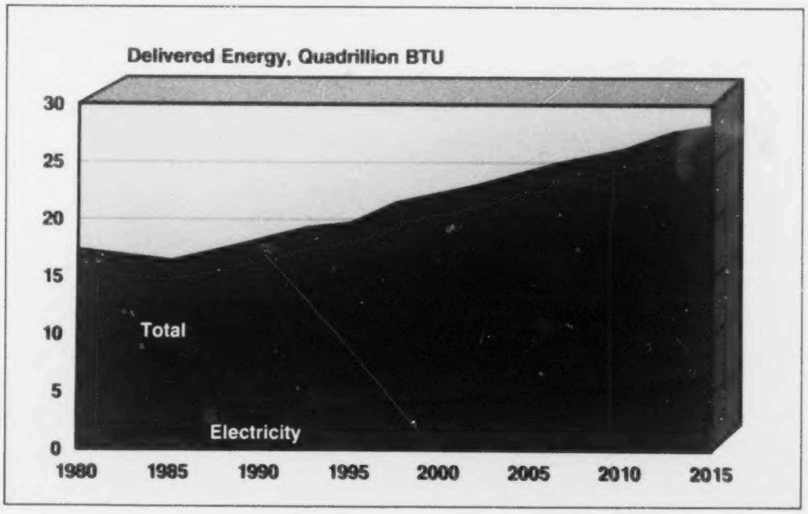


Table 6

Industrial Sector: Energy and Electricity for End Use

	1987	2000	2015
TOTAL OUTPUT			
value of shipments billions 1977$	2,018.3	2,974.6	4,215.8
avg. ann growth, previous 15 years	2.7%	3.0%	2.4%
DELIVERED ENERGY TO END USE			
quadrillion Btu	17.4	22.7	28.9
avg. ann growth, previous 15 years	– 1.6%	2.1%	1.6%
ELECTRICITY USE			
quadrillion Btu	3.2	4.7	6.7
avg ann growth, previous 15 years	1.9%	3.0%	2.3%
share of total end use energy	18.5%	20.8%	23.1%
ENERGY USE INTENSITY			
thousand Btu per 1977$ of output	8.6	7.6	6.8
ELECTRICITY USE INTENSITY			
thousand Btu per 1977$ of output	1.60	1.59	1.59

alternative fuels such as natural gas, and some approaching saturation in applications such as electronic office equipment.

Industrial Sector

The Project's forecast depicts a strong growth of the industrial sector's role in the nation's overall energy picture, although industrial energy requirements will not grow as fast as real output. Electricity requirements, however, are expected to grow at about the same pace as real output throughout the forecast period. (See Figure 12 and Table 6.)

More than a 20 percent improvement in the amount of energy required per unit of real economic output is forecast. Some of this reflects both the diversity and the changing composition of industrial output. Nevertheless, significant improvements are projected in the overall energy intensity of each of the 23 major industrial segments examined, driven by continuation of a number of factors. These include higher prices for all forms of energy; cost-cutting in the face of growing competitive pressures; and improving skill in engineering energy efficiency improvements, including the active support provided to industrial customers by utilities.

In the recent past, two major countervailing forces have been influencing industrial electricity use. Growing opportunities for introducing more electricity into production to improve operational efficiency, manpower requirements, and quality control have come through automation, computerization, flexible manufacturing systems, and so on. Increased efficiency of existing electricity use in plant operations as a measure to attain strategic cost reductions has been aided by advanced technologies in motors, lighting, etc. Both forces promise to remain significant influences on industrial energy decisions.

Emerging technology will enhance both trends—from advanced industrial motors and drives with improved operational efficiency; to a growing host of electro-technologies for process operations, such as lasers, microwaves, and advanced electrochemistry; to computer-aided design and engineering tools; and devices for improved control and resource optimization of production processes.

Transportation

The extensive U.S. transportation system is greatly dependent on petroleum products. Electricity has accounted for only around 0.4 percent of the transportation sector's total end use requirements in recent years. About 80 percent of electricity's total is for pipeline operations and the rest for passenger railroads. Petroleum issues will continue to dominate the transportation sector for the next several decades.

Though the base is small, future prospects for growth in transportation's requirements for electricity are upbeat: demand will more than double by 2015.

Some of the new demand will come from the expansion of current applications: additional pipelines for transportation of coal, oil, and natural gas;, and expanded rail systems, including perhaps during the forecast period construction of major high-speed rail lines based on advanced power systems.

Demand also is expected to come from electrically-powered vehicles. Advances in storage batteries and associated technologies now appear likely to yield cost and performance characteristics that will support the penetration of electric vehicles in some transportation markets, particularly post-2000. Air quality concerns and energy economics may begin to tip the scale in favor of electric vehicles as the turn of the century approaches. EP

EFFICIENCY IMPROVEMENTS' ROLE IN MEETING FUTURE DEMAND

By William McCollam, Jr.

William McCollam, Jr., is President of Edison Electric Institute. His comments are adapted from testimony he delivered February 7, 1989, at a hearing on national energy supply issues held by the Subcommittee on Energy and Power, Committee on Energy and Commerce, U.S. House of Representatives.

. . . It is important to underscore—in the strongest possible terms—that this industry and its customers have achieved substantial improvements in the efficient production and use of electricity and that energy efficiency plays a crucial role in our industry's strategies for an adequate, reliable, and affordable electricity supply in the future.

The history of this industry clearly demonstrates our long-term commitment to efficiency. As an example, the number of utility-sponsored end-use energy efficiency programs has grown from 134 in 1977 to nearly 1300 currently. Utility budgets for these programs now exceed $1 billion per year and have resulted in estimated capacity savings in excess of 21,000 megawatts since 1977. Total capacity savings from these programs may well exceed 45,000 megawatts by the year 2000.

This record of accomplishment means we have a serious commitment to demand-side options. The industry will continue to work as closely as possible with government and our customers to continue to improve energy efficiency. Achieving that goal means development of new and more efficient end-use applications as is done at the Electric Power Research Institute backed by industry-wide funding.

It also explains our industry's continued support for such sensible legislation as the National Appliance Energy Conservation Act, and it will require continued support from public utility commissions to permit utilities the flexibility to conduct pilot programs in rate design to increase the range of services available to customers. It means adopting such model energy codes as the one recently promulgated by the Council of American Building Officials. And, it means sound policy in light of growing public concern over potential global climate change.

Make no mistake. Improvements in end-use efficiencies can have a profound effect on supply requirements, and for this reason we will continue to improve and aggressively pursue programs in this area. However, these efforts will mean little if we ignore the nation's absolute requirement for an adequate and reliable supply of electric energy. New plants are needed to replace aging facilities as well as to meet even moderate economic growth.

Developing methods to achieve balance between supply and demand is not an easy task and cannot be done in a vacuum. Just as it would be foolish to encourage the wasteful use of electricity, it is equally foolish to discourage new uses which improve productivity and quality of life. We must do everything reasonable on both the demand and supply sides of the equation with the full recognition that a failure to consider the problem holistically will lead to critical errors with major consequences. . . .

Mergers and Acquisitions

Although not the inevitability some observers claim, M&As can be a valuable strategic option for some utilities, if pursued wisely.

It was too much to suppose that the merger and acquisition storm sweeping American enterprise—which I understand is a $100-billion-a-year business and growing—would always stop short of the electric utility industry. And why should it?

Let's not forget that there are few, if any, utilities left today that aren't the result of past multiple consolidations, mergers, and buyouts. Indeed, in the frenzied financing that disgraced the 1920s when leveraging holding companies was raised to an art form, it was the electric utilities who led the way.

That history, in fact, may be one reason some utilities are slow to join today's M&A parade.

Another reason may be that, with few exceptions, today's electric utility executives have no memory of when their company was not as it now is, geographically in terms of service territory or organizationally in terms of business form. In many cases, their training, their leadership models, their entire business career and most of their social experience have been limited to the confines of a single enterprise operating in solitude in just one part of the country. This insularity of experience may well be the single-most controlling influence on the prospects for corporate restructuring, mergers, and acquisitions in the investor-owned electric utility industry.

During my own career, for example, I found that almost without exception whenever I approached a utility that abutted my company or was within reach of it and I gently introduced, in the least threatening way I could contrive, the mere thought of possibly exploring the idea of merging—not a specific proposal, mind you, no question about who might be the surviving entity—I was greeted with the same enthusiasm you would expect if I had delivered news of a death in the family.

At the same time, however, I confess I feel a certain ambivalence when I hear the confident prediction that these "new winds" of competition are going to flatten old corporate walls, most of which have stood unchanged since 1935. I find myself wondering if those who are so confident about this industry's future are aware of its truly remarkable history of durability and resourcefulness.

In my own lifetime, this industry has successfully withstood a public power movement aimed at its very extinction, weathered depressions and war, satisfied unimagined economic growth and demand of electricity, countered competition from cheap natural gas and onsite generation, accommodated the environmental movement, embraced nuclear power and survived the public fallout, overcome record interest and inflation rates at the peak of its multi-billion-dollar construction program, absorbed overcapacity from qualified facilities, battled hindsight regulation, and more.

Yet, we are still here, selling our stock above book value, paying dividends regularly (and usually increasing them), while providing world-class service at low rates.

This is not a bad record. This is not the picture that some pundits paint of a struggling industry that needs rescuing by New Age consultants or by regulators who don't really believe in regulation but are in thrall to the chimera of the free market.

Still, I know this rich record of success will not move the soul of those who harken to the cry, "Remember the Alamito!" And, I am not suggesting to them that we are an industry that reached the final and unchangeable boundaries of corporate perfection in 1935. I do want to remind them, however, not to forget that the companies making up this industry have proven to be remarkably hardy and resilient in the face of much tougher problems than any I see on the horizon.

To be sure, corporate restructuring involving mergers and acquisitions is an available strategic option, as it always has been, and perhaps it has been underused in the past. But, at this time, M&As seem to me to be just that: an option, not an inevitability.

The M&A Option

If M&As are, indeed, an option, what do the models in the unregulated segment of the economy tell us about how they might apply in the electric utility industry? For example, is the Boone Pickens' style of free-booting hostile take-over likely in this industry?

William Wall is now an attorney with Siberlus, Lonergan, Crowley and Pearson. His career encompasses almost thirty years of utility experience, including executive positions with Consolidated Edison of N.Y. (1965–73) and with Kansas Power & Light Co. (1974–87), where he served as Chairman, President, and CEO.

Will mergers and acquisitions drastically alter the corporate boundaries of electric utilities?

I don't think so. That type of raid requires speed as well as stealth, and the cash offer typical of at least part of such deals is too easily frustrated, not because of the by-laws and article modifications so popular among take-over candidates today, but because—and this may sound quaintly old-fashioned—we are still public service companies. In fact, the supply of electricity is considered so vital to modern society that it is a government function almost everywhere else in the world. Here in the United States, the bulk of the electricity supply industry is investor-owned, but we should not forget that there is still a lot of *public* in our business.

Consequently, utility management ought to be able to confect enough commission, legislative, and local hearings to drag out the process of the conventional hostile raid to unacceptable limits. And, for the Pickens of this world, delay is the same as defeat.

More likely, and more realistic, is the "friendly" or "semi-friendly" offer of shares for shares, as in the recent merger between Utah Power & Light and Pacificorp or as

Southern California Edison and San Diego Gas & Electric are currently pursuing.

The shape of the power industry has changed little since the passage of the Public Utility Holding Company Act in 1935, the same year Roosevelt dedicated the Hoover Dam and created the Rural Electrification Administration.

Henryk Tomasz Kaiser / Uniphoto

Michael Pettypool / Uniphoto

Hostile take-overs like those Boone Pickens is famous for probably can be derailed by lengthy public hearings.

Even between friendly companies, however, a successful merger is not guaranteed. Still, a few simple guidelines can increase the odds of success. In some instances, exceptions to these rules can and should be made, but as general recommendations, I think each has merit and can help make mergers between utilities more likely.

First, you have to face the problem of credible motivation. Why do you want to acquire another utility? What do you tell people? For unregulated businesses, the answer is easy: the prospect of releasing hidden equity values—by selling off subsidiaries, reducing duplicative costs, tapping new markets, etc.—could translate into higher prices for the company's stock. But for regulated utilities, which are already banging their heads on comission-imposed ceilings on return on equity, where management-achieved cost savings flow through the company to the customer, the benefits are harder to define.

Yet there is nothing frivolous about the urge to put together a large utility out of smaller ones, a utility that will have greater financial resources, that better blends producing assets with market demands, that makes better use of transmission facilities, that opens up training and career development opportunities for its employees, and that can be a real factor in the economic development of a region.

This kind of vision, however, is not necessarily dependent upon being the surviving entity. Hence, **rule one:** If you really want to build something, then look at your company and see how it fits with your neighbor's, not necessarily as the triumphant survivor, but as part of something new that is bigger, better, and stronger. A much better deal can be negotiated for all concerned—stockholders, employees, and customers of both companies—if you view the merger not as a conquest but as a marriage with a company that has the resources and markets to survive with or without you.

Rule two: Many more offers of mergers would be accepted, I believe, if they were first communicated to the full board of the target company, and not limited to the active management, especially if it were made clear that that board would be welcome on the board of the new, larger and more prestigious company. That invitation would help demonstrate the acquiring company's confidence and genuine desire to see a better enterprise rise in the place of the old one.

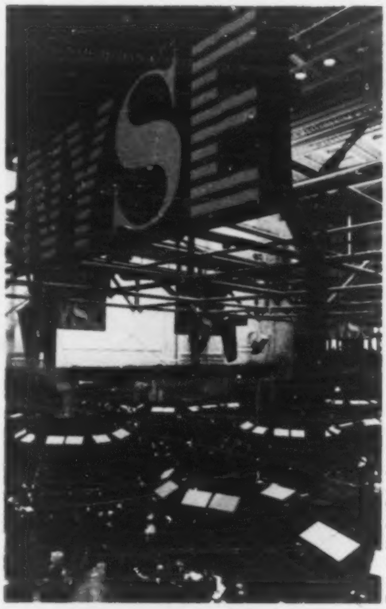
Rule three: Likewise, if a merger between good-sized utilities is contemplated, be sure there is no obvious winner or loser in the deal. For example, consider giving the new enterprise a new name, which will emphasize that the merger is a marriage and not a conquest. Then employees of both entities can begin from merger day to give their loyalty to a new and better enterprise, and none of your employees will suffer the stigma of having worked for the part of the company that was killed and devoured. The new name is also a poultice to politicians, editorialists, retirees, civic and social organizations, and anyone else who would object to the disappearance of something with as important and conspicuous roots in a city or region as has a public utility.

Rule four: Assure everyone, union man and clerk, middle manager and vice president, that he or she will have a job at the same wage and salary level after the acquisition. In other words, don't predicate the success of the merger on human sacrifice. In the first place, labor costs are not by any stretch of the imagination the biggest segment of expense for an electric utility. To be sure, in time, through attrition, labor savings should be sought and made. But, workforce reductions should be achieved across the board, not just from the ranks of the acquired company.

In the second place, you should never underestimate the opposition of a threatened workforce. The airline and railroad industries offer rich examples of that error. To deliberately court opposition by announcing lay-offs is both unwise and unnecessary.

Rule five: There is no requirement to address rates except to say they will not go up as a result of the acquisition. A merger should be sensible and supportable for other reasons, such as balancing coal and nuclear generation, diversity of load, utilization of transmission assets, elimination of duplicative equipment and the like, all of which may ultimately work to reduce rates, but one does not need to promise customers a reduction before the negotiations have even begun.

More important, it seems to me, is that the acquiring utility have earned a record of good service. If your company has a humane and sensible credit policy, has enough phone lines to let your customers get through when they need to most, when service is interrupted, delivers friendly, cheerful, and efficient service at fair rates, then you can face with confidence the public hearings on your worthiness to be the take-over company.


Catherine Ursillo / Folio, Inc.

"How much should you offer . . . for the stock of the company you seek?—way more than you think it 's worth."

Remember, you are already going to have to pay a healthy premium to acquire the company. To promise in advance to cut revenues is asking a lot of your stockholders. And, although I don't want to harp on the issue, you must remember that corporate acquisitions are not made solely for the benefit of customers, not in any industry. That may be the happy result, but the initial question, whether or not to merge, is a question for shareholders to decide. Will your offer make them money? That's what they want to know and have a right to expect. Later, after the offer is accepted, there will be time and opportunity to satisfy all the varied concerns of the public.

Rule six: It should go without saying that you do not surprise the commission or commissions involved in the possible merger. Indeed, if you don't already have a strong conviction that the commissions will approve, then you are "flying blind" and wasting money. Commissions are charged with administering the law, not calling balls and strikes after the pitch is made. They need to know about proposals of this magnitude early on, and they have a corresponding duty to do more than steeple their fingers and look enigmatic when confronted by them.

The same goes for city leaders and editorialists in the target company's service territory. They have to be courted and persuaded by skillful management.

Rule seven: How much should you offer above book value and market value for the stock of the company you seek?—way more than you think it is worth or that you thought you would ever pay if you truly want to make a deal. You can't value a piece of art by how much the paint, canvas, and frame originally cost the artist less depreciation, nor can you value a utility that way. Don't let your MBAs run their programs and tell you that the company is worth *X* dollars. If that is what their analysis shows, the seller's analysis shows the same thing, and the seller sees no gain at that price. The seller has to get more, a good deal more.

Creating More Than The Sum Of The Parts

The buyer must believe that there is something more there, something

ADMINISTRATION CENTER

Dany Krist / Uniphoto

Mark S. Herstein / Uniphoto

Opposition from a threatened workforce (TWA strikers) or from local officials (San Diego Administration Center) can be a powerful obstacle to the successful completion of a merger.

that can't be measured, that there are hidden opportunities that will surface. The buyer has to imagine that 20 years from now someone will say what a great deal that turned out to be after all. For the wisdom of an acquisition cannot be judged in a year or even five. The long view, the strategic view, is the only one that should be taken.

I have personally tasted the bitter gall of seeing more than one great opportunity lost because I was too timid, too short-sighted, or too close-fisted.

Making the merger succeed takes guts and faith. Guts to submerge ego, guts to buy into the future, guts to share governance. Faith that something worthwhile is being built, something that will distinguish your stewardship, that will set you apart from those utility executives of the past who are only known today because their names are on power plants.

Bruce F. Roberson, Richard O. Weijo, and Mark P. Hattrup

Consumer Perceptions about the Ground Source Heat Pump

Focus group discussions among recent purchasers of residential heating and air conditioning systems provide rich marketing insight for utilities seeking to encourage the adoption of GSHPs.

Ground-source heat pumps use only about one-half to one-third of the energy needed to operate conventional furnaces and air conditioners. Consequently, a high level of market penetration by the GSHP offers direct benefits to both utility companies and individual users of the systems. Widespread use of electric GSHPs will allow utility companies to delay capital expenditures for new facilities to meet peak period energy demands. The cost-effective use of electricity also reduces the likelihood of households switching to a different fuel source for heating.

Consumers can benefit from this technology by being able to maintain comfortable household temperatures at lower operating costs than competing systems offer. In addition, GSHPs have relatively low maintenance costs, are quiet, and have virtually no adverse effects on the environment.

Despite these benefits, the GSHP does not yet play a major role in the heating and air conditioning industry. One explanation is their high purchase and installation cost. Another possible reason is the limited national marketing this product has received. Large manufacturing companies with national distribution have not yet added GSHP equipment to their product line.

To understand reasons behind the slow adoption of GSHPs, focus group discussions were held with recent buyers of heating and air conditioning systems. These discussions were intended to gain insight into homeowners' reasons for buying or not buying a ground source heat pump. The information obtained from these focus groups provides insight into the appropriate directions for future product research, viable positioning alternatives to enhance the market appeal of GSHPs, and the development of promotion strategies.

The Focus Group Process

Focus group sessions use a semi-structured discussion format led by a moderator. The moderator introduces topics for discussion, asks questions to probe key comments, presents concepts to stimulate reactions, and makes sure the discussion does not wander from relevant topics. Respondents are encouraged to present their own opinions.

Focus groups were conducted in Indianapolis and Baton Rouge. These markets were selected upon recommendation from officials of the International Ground Source Heat Pump Association (IGSHPA). Both markets have relatively high penetration of GSHPs. Indianapolis requires more energy to heat homes than to cool them. In contrast, Baton Rouge requires more energy for cooling.

Names of participants included in the focus group discussions were obtained from a variety of sources. GSHP owners' names were obtained from lists of GSHP purchasers provided by local utilities and equipment dealers. Aware nonowners were primarily contacted via random telephone dialing. All of these people were screened for eligibility in a telephone interview and invited to attend the discussion. Participants were screened to ensure that they were heads of household between 18 and 65 years old and that they had purchased a new heating and air conditioning system in the previous three years. For each group of respondents, a screening quota was set for at least three participants who purchased a new home and three who bought a new heating and air conditioning system while remodeling their home.

Participants were asked to address several areas of specific interest. The major discussion topics were as follows:

- The decision-making process, including conducting an informa-

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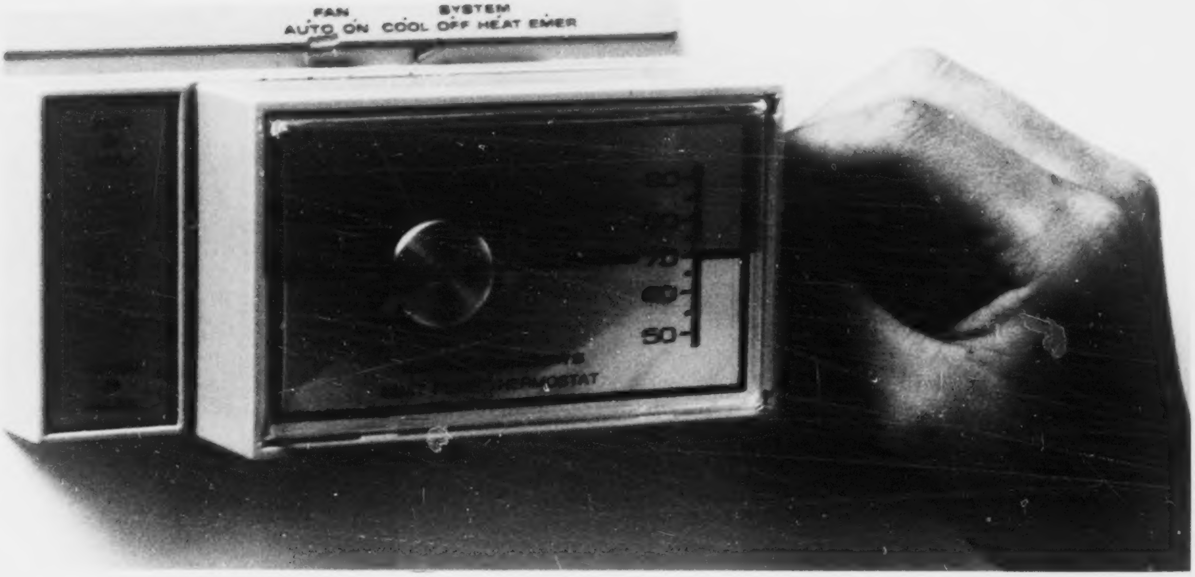
The authors are with Pacific Northwest Laboratory in Richland, Washington. Their research was supported by the Department of Energy under contract DE-AC06-76RLO 1830.

This article is the second in a series featuring various electric utility marketing topics. The first (Winter 1988) described the history of utility marketing and the need for utilities to focus more sharply on their customers'needs and perceptions. The marketing series will continue throughout 1989.

Believing they themselves can make the best decision, GSHP owners take an active role in selecting their system. Non-owners are more passive.



Jon Feingersh / Uniphoto

For all homeowners, operating cost is one of the most important considerations when purchasing a new system.

tion search and finally selecting a specific system.

- Exploration of the importance of various product attributes.
- The role of pricing and subsidies on the purchase decision.
- Differences in the decision processes of GSHP buyers vs. non-buyers.
- Reactions to specific GSHP features.
- Reactions to several marketing concepts.

The Purchase Decision

The intensity of feelings about the performance of their heating and air conditioning system was especially strong among owners of GSHPs. This intensity can partially be understood by looking at their actions before they purchased their systems.

From the moment that the need for a new systems was identified, GSHP owners took a more active role than did non-owners. The owners' high level of involvement may be related to two perceptions that differ from the non-owners. First, the type of heating and air conditioning system was important to GSHP owners. Second, GSHP owners believed they were the most able person to determine which system was best for them. They made a commitment to the selection of the "right" system. As one respondent explained:

> *"I was scared . . . my husband said 'find out all you want about it and we'll get whatever you want' . . . that's a lot of burden . . . What if it collapses? What kind of guarantee do I have and what warranties go with it? How do you know if a line underground breaks? . . . There are all kinds of [questions], and I found the answers."*

Conversely, non-owners of GSHPs generally bought their home without much reflection on the type of heating and air conditioning system and accepted contractor recommendations without much critical evaluation.

A common statement was that they had the system that came with the house and it was not an important factor in their selection of the house. Consequently, the choice of the heating and air conditioning system was typically made by a previous owner or by a contractor.

> *"Our [heating and air conditioning system] came as part of a package deal when we built our house."*

> *"I took [the contractor's] word for what was best."*

GSHP owners conducted a much more extensive information search than did non-owners. This search to increase one's understanding of the GSHP was typically initiated with a request for information from the local electric company. Increased awareness of the GSHP was not typically achieved through word-of-mouth, but then, very few people have the systems yet. Several people then approached sales representatives of contractors and/

or heating and air conditioning dealers. Some obtained a list of owners from the local utility and contacted these people about their system.

"Where you learn more, is not from the electric company . . . just go to the people who have them in."

This high level of involvement in the decision resulted in a well-informed group of consumers. While non-owners often readily accepted the advice of contractors and dealers, GSHP owners were likely to question the accuracy of the information they received. Focus group participants noted that both gas and electricity advertisements make claims to be the most efficient fuel for heating.

Though virtually all owners started their information search with the local electric utility, they were uneasy with the reasons that the utility company was encouraging them to get an efficient system that would consume *less* electricity. Thus, while the utility company seemed the logical place to get information on heating and air conditioning alternatives, the company's credibility was questioned because of an apparent conflict of interests. Future research could determine whether this issue should be addressed in communication programs.

Product Attributes

Homeowners evaluated heating and air conditioning systems on a relatively small number of attributes and issues. The key attributes identified in these focus groups were operating cost, purchase price, subsidy programs, ancillary systems, maintenance, comfort, safety, and environmental issues

Operating Cost: For GSHP owners and non-owners alike, one of the most salient features of their current heating and air conditioning systems is operating cost. GSHP owners consistently mentioned cost factors as features of their systems they liked. Both low operating cost (i.e. monthly heating and cooling costs) and low maintenance costs were cited.

Several of the GSHP owners believed the operating costs of their previous systems were exorbitant. This perception led them to investigate the GSHP and other efficient alternatives.

Our [heating and air conditioning system] came as part of a package deal when we built our house.

Lawrence Rugger / Uniphoto

"I wanted to get away from electric baseboard heat. That's the worst kind of heat you can have I think . . . Our bills were 500 [dollars] and something a month."

"I didn't know what central air conditioning was like . . . we couldn't afford to run our air conditioner."

"The idea of transferring heat from one point to another is much more efficient than creating heat."

Some owners felt that the GSHP saved them as much money as they expected. Others acknowledged some savings, but said that it was not as much as they were led to believe. Even this, however, did not cause anyone to evaluate the system negatively. Rather, evaluations merely became a bit less positive. Owners still felt they obtained meaningful savings and felt that they had the best system available.

While operating cost is a major contributor to the decision to buy a GSHP, this is not a purely financial decision. Buyers felt they were making the best economic decision when they chose the GSHP. However, it is unlikely that the decisions of these people were motivated only by financial considerations. Rather, these buyers appear to have been influenced by the opportunity to exercise personal control over their situation. Future research should assess the impact of advertising that touches on the psychographic variables associated with the desire for personal control and the self-image of target buyers.

Purchase Price: The anticipation of a lower operating cost has to be balanced against the higher purchase price of the GSHP. The additional cost of installing GSHP systems varied greatly, ranging from one thousand to five thousand dollars more than that of other systems considered by these consumers. Not surprisingly, consumers identified the additional up-front cost as a negative attribute.

"[one] . . . problem, the up-front cost. That kind of scared me away because I'm not sure the pay-back period would be small enough to be worthwhile."

"If it's done right, there's almost no disadvantages other than cost."

"The only disadvantage of mine is the initial cost. It cost me about 50 percent more than other systems cost."

GSHP owners talked about the initial cost of their system a lot more than did non-owners. As with most aspects of this decision, the owners seemed more knowledgeable on this topic. This may have occurred because they were deciding on a more expensive system.

Compared with owners, non-owners appeared to be less willing to spend more on the GSHP. Though there may be a big difference in the way these groups view the product, there are other viable hypotheses. Owners may have been equally resistant to the high purchase price, but after conducting their investigation, decided the GSHP was worth the expenditure.

Subsidy Programs: A number of programs were available to help offset the higher cost of installing a GSHP. Virtually all of the GSHP owners took advantage of one or more of these programs. The range of subsidy programs includes tax credits, rebates from utilities, free installation of the loop, and low-interest loans. For some people a subsidy to offset all or part of the high initial cost was *critical* in deciding to get the GSHP.

"We had to get a loan out for this . . . they installed the loop for nothing and that knocked over $1000 off the price. That really made a difference for us . . . our loan was approved. . . . I think if we could have gotten a loan at 6½, that would have been just as good."

"The REMC installed the ground loop for us. That knocked about $1000 off the price."

The extent to which these programs influenced the decision to purchase the GSHP system is not clear. It appeared that a few of the buyers would have bought a GSHP

Public Service Company of Indiana

Subsidy programs to help reduce the relatively high installation cost were critical for some GSHP owners.

without a subsidy. In the words of one owner:

"I already decided to go geothermal . . . then I called the electric company and said, 'Hey, do you got anything you're going to bribe me with to go electric?' and he said 'Yeah, we've got this $400 rebate . . .' "

Many of the GSHP owners identified the high initial cost of their system as a feature they disliked, though few said that they would not have bought the system without the subsidy. Early adopters of an innovation are usually more upscale and, therefore, less price sensitive than the typical consumer. Determining when and what types of subsidies are really necessary should be pursued in future research so these marketing programs can be targeted with maximum effectiveness.

Ancillary Systems: The GSHP has two optional systems. The first system is a "desupercharger" or "desuperheater," which reduces costs for hot water in the winter and virtually eliminates this cost in the summer. Basically, a small loop is added to the system to pass heat through the desupercharger into the hot water tank. The desupercharger works with extremely high efficiency when one is air conditioning. This system is considered a valuable additional benefit by the owners who have it.

"[The desupercharger has] a one-year payback, so you can't afford not to get it."

"In the summer my water is heated virtually for nothing. That was a big selling point on it."

"You can run hot water and it won't cost you any more, and you won't run out of it."

Though the desupercharger is less efficient when one is heating rather than air conditioning, it does reduce hot water costs in all seasons. However, none of the owners knew that the desupercharger worked when they were heating. Communication of this fact could add to the perceived value of the system even beyond the already highly positive appraisal. The few owners who did not own a desupercharger did not know about it. When we discussed it, they seemed very interested in getting one.

The other system that most GSHP owners had was some kind of back-up heater. Obviously, a back-up heating system was more important for people living in Indianapolis than for those in Baton Rouge. Exact conditions vary, but at some point the GSHP cannot produce enough heat to keep the home at the desired temperature.

One woman, whose first system was ruined after faulty self-installation of a back-up system, decided against a back-up on her second system. The rest of the owners who had a back-up heater used electric resistance heat. When the back-up heater was on, consumers typically felt there was something wrong with their system or that it was too small.

"That was one of the drawbacks to me, the back-up heat coming on so much."

"Our back-up system kicks on quite a lot . . . more than I thought it should. When we got the system we weren't even going to put the back-up system in. If we hadn't, I shudder to think what would have happened."

However, one owner insisted that his dealer install a system that was half-a-ton larger than the dealer recommended. He stated that:

"Our back-up ran only two hours for the whole year. That's what I would guess."

Though this statement drew envious comments from the other participants, informed persons outside the group state that too large a system will result in less effective air conditioning performance.

Maintenance: System maintenance has two basic components: cost and convenience. Respondents familiar with air-to-air heat pumps were especially attuned to these maintenance issues, since it seems the air-to-air systems required more maintenance than anticipated.

"Another advantage I've noticed . . . is that the maintenance is a lot less because your equipment is inside in a controlled environment and you have less wear and tear."

"When [I] had the unit on the outside . . . I had to get it cleaned every so often."

The fact that all GSHP equipment is indoors seemed especially important in Baton Rouge. The very wet weather conditions were thought to be especially hard on the outside heat pump equipment.

Another maintenance issue relates to the relatively long expected life of GSHP's relative to air-to-air heat pumps. One owner reported that he did not know air-to-air heat pumps had an expected life of only about ten years until his system quit working after nine years. Though he wanted an efficient system, he did not want to replace it every decade. He selected the GSHP after he found that natural gas was not available in his area. The long expected life of the GSHP was an important contributor to his decision.

It would be useful to examine the value of positioning the GSHP as an alternative to air-to-air heat pumps. This narrower scope may help target more innovative, efficiency-oriented consumers at the top end of the heating and air conditioning market.

Comfort: The GSHP owners were generally satisfied with the

Jon Feingersh/Uniphoto

We looked at the high-efficiency gas furnace before we went with ground source, geothermal. I didn't like it because you couldn't tell if there was a leak . . . if somebody lit a match it would be all over.

comfort provided by their systems. However, as pointed out earlier, they were willing to forego some level of heating comfort to keep monthly bills lower. Nonetheless, the air conditioning performance of the GSHPs was perceived to be exceptional. The even temperature throughout the house was an important performance improvement.

"Within seconds every room is comfortably cool. It's wonderful, I love it."

"I'm comfortable. In every room I go into I'm comfortable."

In terms of heating comfort, the GSHP again rated well on uniform distribution of heat around the house. However, the perception of the comfort level of the warm air at the register varied as a function of the individual's reference point. Former owners of air-to-air heat pumps thought the GSHP produced warm, comfortable air at the register. Conversely, former owners of conventional electric or gas systems gave a less positive evaluation.

"It's not a warm, hot heat like oil. You don't stand on a register and dry your boots out. It's a drafty heat, but it's comfortable . . . I never had that with baseboard heat . . . I'd go upstairs and put a sweater on and downstairs I'd burn up."

"What I like is the warmer air you get out of the register [compared to that generated by the air-to-air heat pump]."

Safety: Though some people felt strongly about safety as a critical attribute in selecting a heating system, for most it was a minor concern. There was a widespread belief that most systems are safe. The concerns that did exist were specific to gas heat.

"The thought of something burning in the house like liquid propane . . . I would always worry."

"We looked at the high-efficiency gas furnace before we went with ground source, geothermal. I didn't like it because you couldn't tell if there was a leak . . . if somebody lit a match it would be all over."

The safety concerns seemed based on bad experience with an old gas stove or furnace several years earlier. It would be very difficult to convince these people that gas could be safe.

Environmental Issues: Several GSHP owners liked the fact that their system was not detrimental to the environment. This included the more efficient use of electricity and the idea of using "natural" heat and cooling from the earth. Several owners also included "noise control" as an environmental issue. They talked about the noise pollution in a neighborhood where air-to-air heat pumps are common and took satisfaction in the knowledge that they were not contributing to this problem. Several respondents also noted that their home was more attractive with the GSHP since they no longer had an outside unit to affect the appearance of their home and yard.

Non-owners gave the environmental issue a lower priority.

"It's important to me but not as much as costs."

"I feel great for the environment, but I'm not willing to pay too many bucks for it."

The Post-Purchase Evaluation

The GSHP owners were extremely satisfied with their systems. All of the owners except one said they would buy the same system again if they had to make that decision again. The one exception said he bought his GSHP in the first place only because natural gas was not available in his area and it was still his preference. Nonetheless, the GSHP remained his second choice. Some general comments include:

"I love it."

"I really like the cooling system of it."

"Geothermal is warmer [than air-to-air heat pumps] as far as the feel of the air coming out of the register."

"You can go to any room of the house and it's comfortable."

"Its [economic savings have] proven [to be] beyond my expectations."

Of course, the GSHP owners made a rather large commitment to their selection. This commitment was psychological as well as financial. Consequently, it may have been especially important for these people to perceive the system as performing well. Several respondents described problems or performance below what was expected, but they generally minimized the importance of the problems. This phenomenon is illustrated in the comments of one woman who said:

"Our bills for two months were quite a bit higher than what the projected analysis was, and that was discouraging . . . every time I walked past my thermostat my blue light was on [indicating the back-up system is active]."

Though this system was not performing as well as she had expected, this woman took personal responsibility for the problem. She went on to explain that she needed to learn when to shut off the back-up system to keep the bills down.

Another respondent whose first GSHP was ruined by a faulty back-up heating system (not installed by professionals) also minimized the fact that the GSHP did not keep the house at the desired temperature.

"We haven't put a back-up system on. On the few days when it gets a little cold inside the house, we just put more sweaters on. Those days pass and then we're okay."

Owners perceived the importance of these problems with the system in heating the home as minor, and they seemed to contribute very little to the overall satisfaction with the system. What's more, poor heating performance was a problem only in the Indianapolis market. Consumers in Baton Rouge were very pleased with the heating performance of their GSHP. It seems likely that the perceived efficacy of this system will remain higher in warmer areas than in colder areas until heating performance of the systems can be improved to minimize or eliminate performance deficits in extremely cold weather.

The priority placed on various heating and air conditioning features is different for GSHP owners than for non-owners. Many GSHP owners had inefficient systems in the past and were determined to get a system with lower operating costs. Thus, GSHP owners generally had a long-term view in examining the alternatives. In addition, they were typically willing to expend time, energy, and money to ensure lower operating costs in the future.

By contrast, non-owners put much more emphasis on having a trustworthy, reliable system. Though they also want lower operating costs, they see the GSHP as still somewhat experimental. Non-owners expressed a reluctance to invest in the GSHP.

"I still don't know about geothermal . . . what I have now works, it's not bad. Before I would venture on unknown territory I would have to know a lot more."

In fact, even after having the system in their home for some time, several GSHP owners expressed anxiety about the fact that the reliability of this new technology was not thoroughly proven. While a five- or ten-year warranty on the compressor helps set owners at ease, they know that they are innovators in owning these systems, and de-

Our back-up system kicks on quite a lot . . . more than I thought it should. When we got the system we weren't even going to put the back-up system in. If we hadn't, I shudder to think what would have happened.

Rick Brady / Uniphoto

spite their careful research of the product, they know that unpredictable problems in the system could occur.

Reactions to Marketing Concepts

Consumers were asked to evaluate four marketing concepts written to reflect four distinct positioning alternatives. They emphasized different benefits of GSHPs and different ways to describe those benefits. Responses are generally consistent with findings from the discussion of attributes, but each concept merits brief discussion. The four concepts also had some common elements, such as the description of how the systems function.

Save $50 Every Month: This concept statement claimed that the GSHP would save owners an average of $50 per month on their heating and air conditioning bills. Respondents found this claim difficult to believe. With so much variety in housing, respondents felt the validity of the claim could not be judged without information on specific homes. Though owners typically felt that they personally were saving more than $50 per month on average, they did not feel that this statement was believable as a blanket claim for the system.

One Third the Cost: This concept stated that the GSHP was so efficient it used only one third as much energy as conventional systems, and, consequently, cost only one third as much to heat and cool a home. Respondents thought that giving a relative efficiency level rather than a specific dollar figure was more believable and more appropriate for a variety of house types. Some people stated that the claim of using one third the energy of conventional systems was probably too strong. A claim of one half was consistent with the experience of most GSHP owners and was, therefore, more believable and didn't sound like a sales pitch.

Clean And Natural: This statement described the GSHP as the natural way to cool and heat one's home and emphasized that it does not pollute the environment or the home as much as other systems. Some owners said this was one of the reasons they bought their GSHP. Others felt that this was a good feature, but it did not drive their purchase decision.

In the summer my water is heated virtually for nothing. That was a big selling point on it. You can run hot water and it won't cost you any more, and you won't run out of it.

F. Levenson / Uniphoto

New Technology Provides One System: This concept emphasized that since the GSHP is an integrated system that both heats and cools, this new technology could efficiently replace separate conventional heating and air conditioning systems. The idea of an integrated system appealed to some, but the fact that this is based on new technology was more of a concern than a comfort. People wanted proof that this technology would work over the long term.

The four concepts all had distinctly different product positions, but they shared a common description of how the GSHP works:

- The system works by transferring heat or cool from the earth to your home through an underground pipe.
- The system can be easily switched from heating to cooling.
- The energy saving will pay for the extra cost of installing the underground pipe in less than three years.

The description of the pipe used to transfer heat or cool was easily understood by respondents and was appealing. One owner commented that the idea of transferring heat or cool rather than creating it just made sense at an intuitive level. Neither owners nor non-owners expressed any concern about having buried pipe in their yard. Since the pipe was several feet underground, no one worried about accidentally digging it up. The only concern

Public Service Company of Indiana

Local utility companies play a pivotal role in educating potential buyers about the GSHP.

about the pipe was the expense of installing it.

The ease of switching the system to either heating or cooling was very appealing. This comment also supported the perception that temperature control would be evenly distributed. Several owners said that no switching was required. The thermostats they had were automatic, and their systems heated or cooled as needed.

One respondent said the claim that the savings would pay for the extra cost of installing the loop was deceptive, not because the claim was untrue, but because that is only a part of the system cost. He felt that the payback schedules should deal with the total cost of the system, not with the incremental cost of the GSHP compared with other systems. However, other respondents did see value to this claim and felt it was appropriate.

Conclusions and Recommendations

Involvement and Innovativeness: From the moment that the need for a new system was identified, GSHP owners took a more active role in the purchase process than did non-owners. In general, GSHP owners were much more involved in the decision to buy a heating and air conditioning system than were non-owners. Conversely, non-owners of GSHPs generally bought their home without much reflection on the type of heating and air conditioning system, and more readily accepted contractor recommendations without much critical evaluation.

This study found that current GSHP owners were innovators. Results from the focus groups suggest that non-owners are a more conservative, risk-averse group than owners are. If marketing programs are to address the concerns of this potential target market, it may be necessary to emphasize the reliability of the GSHP and to provide easily available means of confirming this—such as using testimonials from existing GSHP owners. Contractors must also be educated about the benefits of the GSHP so they will recommend the product to this more conservative audience.

Product positioning: The GSHP cannot be all things to all people. This product must be positioned to meet the needs of selected target markets. Compared to the non-owners, current GSHP owners placed high priority on product quality. For them, high quality was generally equated with low maintenance and operating costs, long expected life of equipment, low noise level, and clean operation. This study suggests that it may be effective for GSHPs to be positioned to compete in the high quality "top end" of the market. Further research is needed to assess the size and characteristics of the market for "top end" systems.

Subsidies: Consumers generally thought the GSHP was too expensive, but this was partially offset by a variety of subsidy programs. While many owners mentioned the high cost as a problem, only about half stated this would have been a barrier to purchase.

Further research should be conducted to evaluate the influence of various types of subsidy programs on different groups of consumers.

Untargeted subsidies can be inefficient because they do not influence the final purchase decision. Further research could assist development of effective and efficient subsidies targeted to selected market segments.

Promotion: Local utility companies play a pivotal role in the distribution of information about the GSHP to individual buyers. Since consumers consistently approach local utilities to get energy information, it would be useful to develop this communication channel further. Approval of the GSHP by the local utility is a source of credibility for this new technology. Consequently, a close working relationship between utility companies, contractors, and GSHP retailers is important.

Though utility companies are typically the starting point in the information search, owners challenged the credibility of this source. They wondered why the electric utility wants to help them reduce their electric bills. Marketers should consider addressing this issue in their sales literature.

Product satisfaction: The GSHP owners displayed extremely high satisfaction with the performance of their systems. There were no complaints at all regarding the air conditioning function of the GSHP. However several owners said the heating performance could be improved. Several people felt their back-up system came on too often, resulting in higher operating costs than necessary.

Future Research: This analysis suggests directions for future market research to facilitate greater market penetration of the GSHP technology. There is a need for a more comprehensive study of current and potential buyers of the ground source systems. Demographic information is needed on the size and characteristics of various potential buyer groups to support decisions regarding which target segments to pursue. There is also a need to quantify the reactions to communication alternatives and the priorities of potential buyers. This research could also explore the types of subsidy programs desired by various market segments. ■

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FINANCIAL REVIEW

THIRD QUARTER EARNINGS UP 2.1 PERCENT

Investor-owned electric utility earnings per share (EPS), before extraordinary items, increased 2.1 percent from $0.95 in the third quarter of 1987, to $0.97 in the third quarter of 1988. The increase in EPS was due to an increase in sales resulting from the extremely hot summer and moderate economic growth experienced during the quarter.

The EPS growth was tempered primarily by two factors. First, both phase-in plans and allowance for funds used during construction (AFUDC) accruals decreased by a combined 31.8 percent in the third quarter of 1988 versus the third quarter of 1987. Approximately 90 percent of the decrease was attributable to the decline of $496 million in AFUDC. Second, four companies incurred writeoffs related to either utility or non-utility assets that would have added approximately 4.2 percentage points to the EPS increase.

Total electric operating revenue increased from $37.1 billion in the third quarter of 1987 to $39.3 billion in the third quarter of 1988. The 6.0 percent electric revenue increase was offset by a 4.4 percent increase in electric operating expenses. This led to an improvement in the operating ratio from 76.4 percent in the third quarter of 1987 to 75.2 percent in the 1988 third quarter.

Electric operating expenses increased from $28.3 billion recorded in the third quarter of 1987 to $29.6 billion in the third quarter of 1988. Other operation and maintenance expense and depreciation expense increased a combined 9.3 percent in the third quarter of 1988 versus the third quarter of 1987. The increase of the two expense items was due primarily to nine companies placing large generating facilities on line since the third quarter of 1987.

Fuel expense increased 2.3 percent from $8.8 billion to $9.0 billion. Fuel expense increased due to greater fuel usage as a result of the higher electricity demand experienced during the summer. The effects of the greater usage were partially offset by overall lower fuel prices including the increased use of nuclear power.

Overall tax costs were lower in the third quarter of 1988 than in the third quarter of 1987 by $259 million. This decrease in tax expense is attributable to the Tax Reform Act of 1986. Deferred tax expense and overall tax expense in the third quarter of 1988 would have been significantly lower than that of 1987 except that a number of sale and leaseback transactions in 1987 lowered deferred tax expense. As a result of tax reform, the amount of deferred taxes booked should be decreasing. However, in the third quarter of 1987, three companies involved in sale and leaseback transactions recorded large credits against deferred tax expense due to current taxes on sale gains.

Costs deferred under phase-in plans decreased 29.3 percent from $315 million in the third quarter of 1987 to $223 million for the third quarter of 1988.

Overall, the electric operating revenue increase of 6.0 percent, coupled with a 4.4 percent increase in electric operating expenses, resulted in an increase of 11.1 percent in electric operating income. From the $8.8 billion reported in the third quarter of 1987, electric operating income rose to $9.7 billion in the same quarter of 1988.

Offsetting the 11.1 percent increase in electric operating income were decreases totaling $307 million in other utility operating income and other income and deductions. Income from combination companies' gas utility operations was hard hit during the quarter as gas demand decreased while average gas prices charged to utilities rose. These factors resulted in a $29 million loss in other utility operating income during the quarter as opposed to a $12 million gain a year ago. Other income and deductions decreased 57.3 percent in the third quarter of 1988 when compared to the corresponding quarter of a year ago. The significant decrease was due to the writeoff of non-utility assets for two companies and the writeoff of abandoned plant by two others. These writeoffs accounted for a loss of $257 million net of tax.

The continuing decline in AFUDC and the diminishing growth of phase-in plans bode well for the quality of earnings. Allowance for funds used during construction (AFUDC) dropped 40.9 percent from $1,215 million in the third quarter of 1987 to $719 million in the third quarter of 1988. Contributing to the decline were completion of plants and lower levels of base load generating plant construction. AFUDC as a percentage of net income available for common declined from 19.7 percent for the third quarter of 1987 to 11.5 percent for the third quarter of 1988.

Phase-in plan accruals (cost deferrals and phase-in revenues) as a percentage of net income available for common dropped from 8.4 percent in the third quarter of 1987 to 7.4 percent during the third quarter of 1988. The net effect of phase-in plan accruals for the third quarter was a non-cash increase to net income of $464 million, representing 10.8 percent less compared to the $520 million increase to net income experienced a year ago. As stated earlier, the cost-deferred portion of phase-in plans declined by 29.3 percent in the third quarter of 1988 over the corresponding period a year ago. The decrease of the cost-deferred portion was primarily caused by one company's phase-in plan which called for the deferral of 49 percent of operating expenses related to a large generating unit brought on line in mid-1987. The substantial deferral represents $102 million of the costs deferred under phase-in plans for the third quarter of 1987. The same company recorded only $3 million in the third quarter of 1988. The income deferral portion of phase-in plans increased 17.1 percent over last year's third quarter.

Extraordinary items reversed from an extraordinary gain of $52 million for the third quarter of 1987 to an extraordinary loss of $66 million in the third quarter of 1988. The 1987 third quarter gain relates to one company's recording the result of favorable litigation on a nuclear fuel contract. The third quarter 1988 extraordinary loss correlates to one company's writeoff of several utility assets and another company's recognition of a loss as it increased its decommissioning reserve.

The coverage ratio decreased slightly during the quarter as net interest expenses and charges rose by 5.6 percent while net income before interest charges rose by only 3.1 percent. The pretax interest coverage ratio for the third quarter, excluding AFUDC, was 3.45 times, representing a 1.0 percent decrease from the 3.47 times of a year ago. The interest coverage ratios including AFUDC, for the same periods, were 3.63 and 3.78, respectively, showing the impact of the decrease in AFUDC.

The electric utility industry's earned return on average common equity (ROE) has been declining since the second quarter of 1984. This declining trend continued for the year ending September 30, 1988, as earned ROE declined to 11.3 percent. The change in ROE reflects lowered earnings, the increase in average common equity, and the downward trend in allowed returns authorized by commissions. Also, if non-recurring items recorded under other income and deductions, extraordinary items, and the cumulative effect of a change in accounting principle for year ending September 30, 1988, are excluded, earned ROE for the year would increase to approximately 13 percent.

The dividend payout ratio (after extraordinary items) of 87.1 percent for the twelve-month period ending September 30, 1988, was up from the 77.6 percent recorded for the same period one year earlier. This increase is attributable to the year's decline in earnings and dividend increases by companies that had previously omitted or reduced them as well as to the normal increase in dividends paid out.

The industry's balance sheet continues to strengthen as construction work in progress (CWIP) decreased 41.8 percent from $67.9 billion as of September 30, 1987, to $39.5 billion as of September 30, 1988. CWIP as a percentage of net plant in service dropped from 23.0 percent to 12.0 percent during the same period of time. Total utility plant increased 11.6 percent to $458.6 billion, as did accumulated depreciation, which increased 11.3 percent to $129.2 billion.

Investments for the industry increased 9.1 percent to $18.7 billion, up from the $17.2 billion recorded September 30, 1987. The increase represents, in many cases, the recording of subsidiary operations of holding companies brought on by a change in EEI's data collection methodology begun in the first quarter of 1988.

Total capitalization for the industry increased from $330.8 billion at September 30, 1987, to $336.0 billion at September 30, 1988, a 1.6 percent increase. The common equity capitalization ratio increased from 43.1 percent recorded September 30, 1987, to 43.4 percent at September 30, 1988. The amount of debt as a percentage of total capitalization increased by 0.2 percentage point to 48.7 percent. While the proportion of common equity and debt contained in the industry's total capitalization continues to increase, the amount of preferred stock in the industry capitalization ratio continues to decline. Preferred stock as a percentage of total capitalization dropped from 8.4 percent to 7.9 percent.

The embedded cost of long-term debt for the twelve months ending

Table 1

Investor-Owned Electric Utility Industry Statement of Income

(Millions of Dollars)

	Three Months Ending September 30,			Twelve Months Ending September 30,		
	1988	1987r	% Change[3]	1988	1987r	% Change[3]
Total Electric Operating Revenues[1]	$39,338	$37,112	6.0	$133,967	$129,423	3.5
Electric Operating Expenses						
Fuel	$ 9,045	$ 8,840	2.3	$ 31,598	$ 31,256	1.1
Other Operation & Maintenance	10,716	9,826	9.1	41,560	37,698	10.2
Depreciation & Amortization	3,527	3,202	10.2	13,920	12,373	12.5
Costs Deferred Under Rate Phase-in Plans	(223)	(315)	(29.3)	(1,043)	(1,096)	(4.8)
Taxes Other Than Income Taxes	2,836	2,597	9.2	10,505	9,847	6.7
Income Taxes: Federal & Other	2,797	3,049	(8.3)	6,089	6,995	(13.0)
Deferred Income Taxes	918	910	0.9	2,844	4,662	(39.0)
Investment Tax Credits, Net	(19)	235	N.M.	(52)	257	N.M.
Total Electric Operating Expenses	$29,598	$28,342	4.4	$105,422	$101,993	3.4
Electric Operating Income	$ 9,741	$ 8,769	11.1	$ 28,565	$ 27,431	4.1
Other Utility Operating Income	(29)	12	N.M.	1,144	1,184	(3.4)
Total Utility Operating Income	$ 9,712	$ 8,781	10.6	$ 29,709	$ 28,615	3.8
Other Income & Deductions—Net	198	464	(57.3)	314	1,020	(69.2)
Phase-in Deferrals	241	205	17.1	980	828	18.4
Allowance for Other Funds Used During Construction	363	744	(51.2)	1,701	3,400	(50.0)
Total Income Before Interest Charges	$10,514	$10,195	3.1	$ 32,705	$ 33,863	(3.4)
Interest Charges						
Interest on Long-Term Debt	$ 3,713	$ 3,689	0.6	$ 14,761	$ 14,776	(0.1)
Other Interest Expenses & Charges	299	244	22.2	919	991	(7.2)
Allowance for Borrowed Funds Used During Construction	(356)	(471)	(24.5)	(1,482)	(2,098)	(29.4)
Net Interest Expenses & Charges	$ 3,656	$ 3,463	5.6	$ 14,199	$ 13,668	3.9
Net Income Before Extraordinary Items	$ 6,858	$ 6,732	1.9	$ 18,506	$ 20,195	(8.4)
Extraordinary Items	(66)	52	N.M.	(67)	(226)	N.M.
Cumulative Effect of a change in accounting principle[4]	0	0	N.M.	(1,455)	(1,077)	35.0
Net Income	$ 6,792	$ 6,784	0.1	$ 16,985	$ 18,892	(10.1)
Preferred Dividends Declared	537	599	(10.5)	2,236	2,536	(11.8)
Net Income Available for Common	$ 6,255	$ 6,185	1.1	$ 14,749	$ 16,356	(9.8)
Common Dividends Declared	3,245	3,257	(0.4)	12,842	12,699	1.1
Additions to Retained Earnings	$ 3,011	$ 2,928	2.8	$ 1,907	$ 3,656	(47.9)
Average Shares Outstanding[2]	6,511	6,448	1.0	6,495	6,413	1.3
Earnings Per Share Before Extraordinary Items and the Cumulative Effect of a change in accounting principle[2]	$ 0.97	$ 0.95	2.1	$ 2.50	$ 2.75	(9.1)
Earnings Per Share After Extraordinary Items and the Cumulative Effect of a change in accounting principle[2]	$ 0.96	$ 0.96	0.0	$ 2.27	$ 2.55	(11.0)
Common Dividends Per Share[2]	$ 0.50	$ 0.51	(2.0)	$ 1.98	$ 1.98	0.0

SOURCE: EEI Survey Data and Standard and Poors Compustat II Database Service

[1] Revenues are adjusted for intra-industry sales for resale of electricity.

[2] Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.

[3] Percent changes may reflect roundings.

[4] Total reflect 1988 and 1987 first, second, and third quarter data only.

r—Revised to reflect company restatements.

N.M.—Not Meaningful.

Table 2

Investor-Owned Electric Utility Industry Balance Sheet

(Millions of Dollars)

Assets	Sept. 30, 1988	Sept. 30, 1987r	Percent Change[3]
Utility Plant[1]			
Utility Plant (Including Nuclear Fuel)	$458,563	$410,935	11.6
Less Accumulated Depreciation	129,160	116,078	11.3
Total	$329,404	$294,858	11.7
Construction Work in Progress	39,545	67,902	(41.8)
Net Utility Plant	$368,948	$362,759	1.7
Investments	18,745	17,179	9.1
Current Assets	41,807	42,995	(2.8)
Deferred Debits	29,146	24,966	16.7
Total Assets	$458,647	$447,899	2.4
Capitalization & Liabilities			
Capitalization			
Common Stock	$ 92,082	$ 90,324	1.9
Retained Earnings	53,697	52,416	2.4
Preferred Stock	26,573	27,694	(4.0)
Long-Term Debt	163,667	160,371	2.1
Total Capitalization	$336,019	$330,806	1.6
Current Liabilities			
Short-Term Debt	$ 7,024	$ 6,924	1.4
Long-Term Debt Due Currently	5,204	5,371	(3.1)
Other Current Liabilities	31,366	31,928	(1.8)
Total Current Liabilities	$ 43,594	$ 44,223	(1.4)
Deferred Credits			
Capital Lease Obligations, Non-Current Portion	$ 5,091	$ 5,063	0.5
Accumulated Deferred Income Taxes[2]	44,907	41,016	9.5
Accumulated Deferred Investment Tax Credits	16,894	17,145	(1.5)
Other Deferred Credits	12,143	9,646	25.9
Total Deferred Credits	$ 79,034	$ 72,870	8.5
Total Capitalization & Liabilities	$458,647	$447,899	2.4

SOURCE: EEI Survey Data and Standard and Poors Compustat II Database Service

[1] Includes non-electric utility plant.

[2] Includes property-related deferred income taxes.

[3] Percent changes may reflect roundings.

r—EEI changed its reporting methodology so that property-related deferred income taxes are now entered as a liability rather than a reduction to plant. Data for 1987 also have been revised to reflect company restatements.

STATISTICAL REVIEW

September 30, 1988, was 9.1 percent. This ratio was constant with the twelve months ending June 30, 1988, embedded cost of debt of 9.1 percent.

Short-term borrowing, which peaked at $9.4 billion as of June 30, 1988, decreased to $7.0 billion as of September 30, 1988. Short-term debt showed a 1.4 percent increase of $100 million for the twelve months ending September 30, 1988, over the $6,924 million recorded for the twelve months ending September 30, 1987.

Note that the EPS decrease is lower than the EPS percentage drop reported by others. EEI methodology is to include in EPS figures the effects of non-recurring items such as accounting changes and asset writeoffs. Although the results reflect the true financial condition of the industry as reported, it somewhat masks the earnings capability of the industry from continuing operations. The relatively high incidence of writeoffs, asset sales, and accounting changes during 1987 and 1988 has led to a gap between EEI's and others' EPS figures.

Tables 1 and 2 are based on unaudited reports submitted by a sample of investor-owned electric utilities. The sample represents approximately 94.5 percent of the investor-owned electric utility industry's total assets and 97.5 percent of its electric utility revenues. The sample data are adjusted to represent the entire investor-owned electric utility industry by using the Standard & Poor's Utility Compustat II database. The 1987 data also have been revised to reflect all company restatements with the exception of the fourth quarter of 1987.

Contributed by Edison Electric Institute's Finance and Accounting Department.

Spencer Grant / Uniphoto

THIRD QUARTER SALES UP 4.9 PERCENT

The long heat wave felt across most of the nation last summer and a strong economy pushed investor-owned electric utilities' electricity sales to ultimate customers up to 545.7 million megawatthours (MWh) for the third quarter of 1988, a 4.9 percent increase over 1987's third quarter total of 520.1 million MWh.

The increase is particularly dramatic in light of 1987's third quarter sales increase of 6.4 percent over the previous year's third quarter.

Cooling degree days for the quarter were approximately 10.6 percent above normal. (Cooling degree days are units measuring the extent to which the outdoor mean temperature rises above an assumed base of 65 degrees Fahrenheit. One cooling degree day is counted for each degree over the base for each calendar day during the period.)

The Federal Reserve Board Index of Production third quarter average increased 5.6 percent over its 1987 third quarter average. Gross National Product rose by 2.6 percent in constant 1982 dollars on a third-quarter/third-quarter basis.

The largest quarterly sales increase occurred in the commercial class, where sales rose 6.1 percent from 154.4 million MWh in 1987 to 163.8 million in 1988. Likewise, of the top three customer classes—residential, commercial, and industrial customers account for over 99 percent of all ultimate customers and for about 97 percent of all electricity sales and revenues—the commercial class experienced the largest increase in the number of customers, 2.4 percent. Revenues for that class were up 6.0 percent.

Residential sales grew by 5.8 percent from 177.7 million MWh to 188.0 million MWh, as the number of residential customers grew by 1.8 percent. Revenues for this customer class rose by 6.8 percent to $1.55 billion as a result of the sales increase.

Sales to industrial customers were up 3.4 percent over the third quarter of 1987, with an associated revenue increase of 3.9 percent. This class experienced the lowest growth in the number of ultimate customers, 1.6 percent.

Table 1
Third Quarter Customers, Sales, and Revenue Data for Investor-owned Electric Utilities

	Three Months Ended September 30,			Twelve Months Ended September 30,		
	1988	1987	% Change	1988	1987	% Change
Number of Customers						
Residential	71,461,387	70,216,967	1.8	71,097,201	69,829,151	1.8
Commercial	8,926,593	8,714,726	2.4	8,840,316	8,610,473	2.7
Industrial	377,062	371,151	1.6	368,271	364,093	1.1
Street & Highway	132,061	128,843	2.5	129,898	126,704	2.5
Other Public Authorities	151,514	147,946	2.4	149,899	146,381	2.4
Railroads	22	21	4.8	22	21	4.8
Interdepartmental	458	424	8.0	442	432	2.3
Total Customers	81,049,097	79,580,078	1.8	80,586,049	79,077,255	1.9
Electricity Sales (MWh)						
Residential	187,971,576	177,743,278	5.8	640,114,209	618,829,186	3.4
Commercial	163,807,384	154,382,832	6.1	568,247,755	540,037,105	5.2
Industrial	178,483,318	172,644,157	3.4	680,195,175	651,663,332	4.4
Street & Highway	2,475,340	2,463,618	0.5	10,400,442	10,349,814	0.5
Other Public Authorities	11,863,649	11,831,505	0.3	43,921,331	43,195,517	1.7
Railroads	623,804	555,267	(10.1)	2,363,044	2,251,699	4.9
Interdepartmental	498,966	527,844	(5.5)	1,724,388	2,401,249	(28.2)
Total Sales	545,724,037	520,148,501	4.9	1,946,966,344	1,868,727,902	4.2
Revenues ($000)						
Residential	15,523,420	14,535,694	6.8	49,729,120	47,864,328	3.9
Commercial	12,080,388	11,393,379	6.0	40,804,280	39,087,838	4.4
Industrial	9,126,212	8,780,915	3.9	32,721,158	32,085,850	2.0
Street & Highway	293,538	293,623	(0.0)	1,182,619	1,190,504	(0.7)
Other Public Authorities	640,496	641,326	(0.1)	2,338,960	2,327,170	0.5
Railroads	41,924	37,062	13.1	148,808	149,831	(0.7)
Interdepartmental	29,691	36,844	(19.4)	106,124	151,769	(30.1)
Total Revenues	37,735,669	35,718,843	5.6	127,031,069	122,857,290	3.4

SOURCE: Edison Electric Institute, Statistics Department

Average kilowatthour (kWh) use per customer rose a sharp 3.0 percent during the quarter, due in part to the hot weather. The largest percentage increase occurred among residential customers, who increased their average usage by 3.9 percent. The average revenue per kWh sold rose 0.7 percent from 6.87 cents to 6.91 cents.

The third quarter saw a break in a two-year-old trend in the relationship between revenue and sales growth as revenue growth surpassed sales growth on a percentage basis for the first time since the second quarter of 1986. The interruption in the trend is attributed primarily to a few companies being required to change their rate structure in 1988. Because of the change, quarter-to-quarter comparisons about 1987 and 1988 revenues are somewhat distorted, although annual revenues are not expected to be affected significantly.

Removing the effects of those few companies almost returns the relationship between revenue and sales growth to its 1987 third quarter status. The slight remaining change in pattern could be attributed to several factors. First, because pricing structures have become increasingly sensitive to seasonal and hourly usage patterns, as utilities approach peak capacity during periods of high demand, costs per kWh charged to customers are incrementally higher. Second, a few utilities were granted small rate increases associated primarily with the inclusion in rate base of recently completed nuclear plants. Third, the customer mix, wherein customers with higher than average per kWh charges had larger than average sales gain, may have had a small influence on the revenue growth.

Table 1 provides customers, sales, and revenue data for investor-owned electric utilities for the quarter and the year ending September 30, 1988. ▰

Contributed by Edison Electric Institute's Finance and Accounting Department.

TECHNOLOGY REVIEW

ADVANCED HEAT PUMP OFFERS GREATER EFFICIENCIES

The result of more than five years of joint funding and development by the Electric Power Research Institute (EPRI) and Carrier Corporation, a new heat pump that offers heating and cooling efficiencies 30 to 40 percent greater than the average model on the market today—was introduced in January at the National Association of Home Builders Convention in Atlanta.

Produced and marketed by Carrier under EPRI license, the new product is called HydroTech 2000™ Advanced technology such as electronic variable speed drives with improved defrost, integrated water heating, and microprocessor controls have been incorporated in the heat pump design to produce high overall efficiency, maximum comfort by close temperature and humidity control, and low noise levels.

"The EPRI-Carrier heat pump is not just a more efficient heat pump but represents a new dimension in comfort and service. It is one of the most significant improvements in heat pumps in years," said Arvo Lannus, EPRI Manager of Customer Systems Residential Programs. "The product was conceived with the clear aim of benefiting residential and small commercial customers and more efficiently using the electricity supply."

Unlike the conventional heat pump's frequent on-off cycling, the advanced heat pump's variable speed electronic compressor continuously changes its speed to match the desired heating or cooling—and does it within 1 degree Fahrenheit. The variable speed system can go to a high speed to deliver the desired warmer or cooler air quickly and then cycles at a lower speed to maintain the temperature while using less energy.

For maximum comfort and efficiency, the variable speed drive indoor fan, with its improved defrost capability, eliminates the burst of cool air of typical units starting on cold days. Variable speed drive also means better humidity control. Unlike conventional high-efficiency heat pumps, the advanced heat pump cools at low speeds so moisture collects on the indoor coil and drips off providing precise control of humidity with a humidistat.

Indoors the unit is quiet, making less noise than the average refrigerator. The outdoor component of HydroTech 2000™ is eight times quieter than conventional heat pumps.

Energy for water heating is a "free" spin-off from the operation of the heat pump in the cooling mode. With an EPRI-patented refrigerant-to-water heat exchange system, the advanced heat pump can supply most of a home's summer hot water from waste heat. On cold winter days when the unit's full capacity is required for room heating, a sensor will switch on a conventional resistance element in the water tank. When only hot water is required, the heat pump runs at an efficiency-optimized speed and maintains the desired water temperature using only a small amount of electricity.

Microelectronic controls are key to the advanced heat pump's integrated operation. Temperature and pressure sensors at numerous points in the system tell the unit how it should be operating and when to decrease or increase speed. The sensors read the homeowner's input from one or more digital thermostats which may be push-button preset for day and night temperature settings.

The microelectronic controls on the thermostat include self-monitoring and diagnostic devices to alert a homeowner or a service technician to a problem and its cause.

The controls also allow the utility an opportunity for load management. At times of peak power demand on extremely hot or cold days, a radio or powerline signal from the utility, with the customer's agreement, can automatically limit the heat pump's power consumption with little or no change in comfort.

In addition to the direct load management benefits, the electric utilities also realize efficiencies in operation.

The advanced heat pump is an ideal product for accommodating growing customer demand for electric space heating, cooling, and water heating. Yet, the HydroTech 2000™ has 40 to 60 percent less demand for power than conventional heat pumps, air conditioners, and water heaters because of its variable speed operation and demand-control features. Also, the electricity use is spread more uniformly throughout the day.

The advanced heat pump ranks as a first technically and also for EPRI in the type of contractual agreement. Usually, EPRI-funded technology is licensed on a nonexclusive basis. But with the advanced heat pump, where Carrier provided a significant share of the nearly $6 million in development funding, Carrier holds a limited exclusive license.

"What EPRI's really done is play a catalytic role to accelerate by three or four years the commercial availability of this advanced technology," said Arnold Fickett, vice president of EPRI's Customer Systems Division. ▰

REGULATORY REVIEW

SECOND QUARTER 1988 RATE ACTIONS

Rate increases of $437.3 million on an annualized basis were approved by utility commissions for investor-owned electric utilities during the second quarter of 1988, a modest 3.5 percent increase over the $422.4 million approved during the first quarter of 1988.

Of the ten rate cases associated with approved rate increases, all but one were related to the cost recovery of nuclear plants, and a majority represented interim rate increase approvals. The dollar amount of rate increases approved during the second quarter increased by 59 percent over the same quarter a year ago, from $275.7 million to $437.3 million, while the number of rate actions dropped significantly from 19 to 10.

Approved rate decrease amounts also experienced an increase, climbing from $342.9 million in the first quarter of 1988 to $381.1 million in the second quarter, an 11.1 percent jump. The average rate increase approved per rate order was $43.7 million, while the average rate decrease approved per rate order was $34.6 million.

Since the end of 1985, the level of rate decrease amounts has been approaching that of increase amounts. The decline in rate increase levels is associated with the decline in industry baseload generation construction activity, a lower inflation rate, and lower capital costs. The rise in decrease amounts continues to be associated with factors such as the Tax Reform Act of 1986, the use of incentive rates and other innovative rate structures (to retain and attract new load), and programs to reduce debt financing and operating costs.

Rate increase amounts filed by the industry during the second quarter of 1988 reached $408.6 million, a nominal increase of 3.0 percent over the first quarter amount of $396.5 million. In contrast, rate increase amounts filed during the first and second quarters of 1987 reached $2,254.4 million and $1,847.6 million, respectively. The significantly higher level of rate increase amounts filed during the first half of 1987 compared to 1988 is attributable to several companies which sought rate recognition for newly completed plants.

State commissions approved an average of 53.8 percent of the amounts requested by utilities in their rate increase filings during the second quarter, much better than the 39.8 percent approved during the first quarter of 1988. The estimated regulatory lag increased from 9.6 months for the first quarter of 1988 to 10.7 months for the second quarter.

Utilities filing applications with state commissions during the quarter requested an average return on common equity of 13.60 percent. The average allowed return on common equity for rate cases decided during the quarter was 12.46 percent as compared with the first quarter rate of 12.82 percent.

The backlog of rate cases pending from previous quarters was reduced somewhat during the second quarter. The number of pending rate increase cases dropped from 43 in the first quarter, representing $4,780 million in revenue, to 34 in the second quarter, representing $4,033 million. Likewise, pending rate decrease cases dropped from 12 in the first quarter, representing $200.7 million, to 8 in the second quarter, representing $65.4 million.

Tables 1–3 reflect the results of the EEI Quarterly Rate Action Survey. The survey, compiled by the

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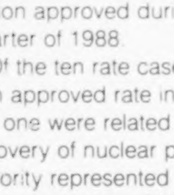

"Organizations are like generating plants or distribution networks. They should be viewed as functional arrangements of systems and components. Some are designed and function better than others. Organizational performance can always be improved through a pragmatic approach using internal staff with outside professional assistance."
Roger W. Griebe, Ph.D., Senior Partner

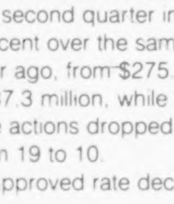

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Table 1

Second Quarter 1988 Electric Rate Actions

Type of Action	Number of Actions		Dollar Amounts ($000)	
	Increases	Decreases	Increases	Decreases
Pending as of 6/30/88				
Filed During Quarter[1]	17	7	408,585[2]	116,062
Pending from Previous Quarters	34	8	4,033,094[2]	65,385
Total Pending	51	15	4,441,679	181,447
Approved During Quarter[1]				
Non-Final[3]	0	0	0	0
Final	10	11	437,315	381,091
Total Approved	10	11	437,315	315,091
Withdrawn During Quarter	3	0	13,234[2]	0
Denied During Quarter[4]	0	0	0	0

[1] Approved changes which were filed during quarter are only counted in the approved category.

[2] The filed and withdrawn numbers do not reflect a case which was withdrawn and immediately refiled in the same amount, in order to permit extension of settlement negotiations beyond a state statutory deadline for decision. The amount ($1,414,900,000) of the rate request is reported as pending from previous quarters.

[3] Includes interim increases not subject to refund, increases under bond, and increases subject to refund.

[4] Only final denial of any increase in rates is reported as denied. When a utility is granted less of an increase in rates than it filed for, the remainder is not reported as denied.

Table 2

Second Quarter Electric Rate Actions: 1987 and 1988

Time Period	Increases Filed During Period		Total Increases Pending at End of Period		Increases Approved During Period	
	Number	Amt ($000)	Number	Amt ($000)	Number	Amt ($000)
Second Quarter 1987	11r	1,847,561r	55r	5,120,623r	20r	322,710r
Second Quarter 1988	17	408,585	51	4,441,679	10	437,315
Percentage Change	+54.5	−77.9	−7.3	−13.4	−50.0	+35.5

r = revised from previously reported data

Table 3
Annual Electric Rate Actions: 1984–June 1988

	Year 1984		Year 1985		Year 1986		Year 1987		Jan.-June 1988	
	Number of Actions	Total Amt ($000)	Number of Actions	Total Amt ($000)	Number of Actions	Total Amt ($000)	Number of Actions	Total Amt ($000)	Number of Actions	Total Amt ($000)
Filed During Period[1]										
Increases	121r	7,524,201r	137	8,309,574r	73r	3,758,092r	48r	5,327,890	28	805,123
Decreases	2	8,269	4	27,092	9	116,815	46	587,189	10	217,677
Pending at End of Period[2]										
Increases	103r	7,887,199r	127r	8,119,686r	82	4,101,029r	54r	5,551,968	51	4,441,679
Decreases	2	8,258	0	0	8	62,815	24	301,867	15	181,447
Approved During Period										
Increases	186	4,745,036	127	4,686,710	104r	2,880,901r	86	2,304,268	18	859,713
Decreases	19	175,045	17	129,678	21	383,038	117	1,441,823	35	723,949
Withdrawn During Period										
Increases	3	158,990	2	83,268	7	589,004	2	22,050	3	13,234
Decreases	0	0	1	305	0	0	1	10,005	0	0
Denied During Period										
Increases	7	451,178	6	419,045	14	903,441	10	996,458	4	118,680
Decreases	0	0	0	0	0	0	10	0	0	0

NOTE: This tabulation represents companies that have reported on a quarterly basis to EEI.

[1] Does not include changes filed and then approved, withdrawn, or denied during same quarter.

[2] These figures are not in addition to the corresponding filed figures.

r = revised

EEI Rate Regulation Department, is based on replies received from investor-owned electric utilities to EEI's standard questionnaire. It includes published information on the number of rate changes filed, pending, approved, withdrawn, or denied, and the dollar totals involved. Rate cases before FERC, state commissions and municipal bodies that regulate investor-owned utilities are included. The Rate Action Survey methodology requires that approvals be reported in the quarter in which the rate change goes into effect. As a result, if a commission orders a phased-in rate increase, the total dollar amount of all phases of the increase is reported in the quarter in which the commission order is issued. EP

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Index to Advertisers

Allied-Signal Inc. 3
Cambridge Reports 38
Consolidation Coal Company . . . . Cover 4
Cresap 6
Decision Focus 6
Energy Management Associates . . . . Cover 2
Florida Power & Light . . . . Cover 3
GE Nuclear Services 4
Management Analysis Company 2
Nerco Coal 7
Organizational Analysis Company 46
Sargent & Lundy 1

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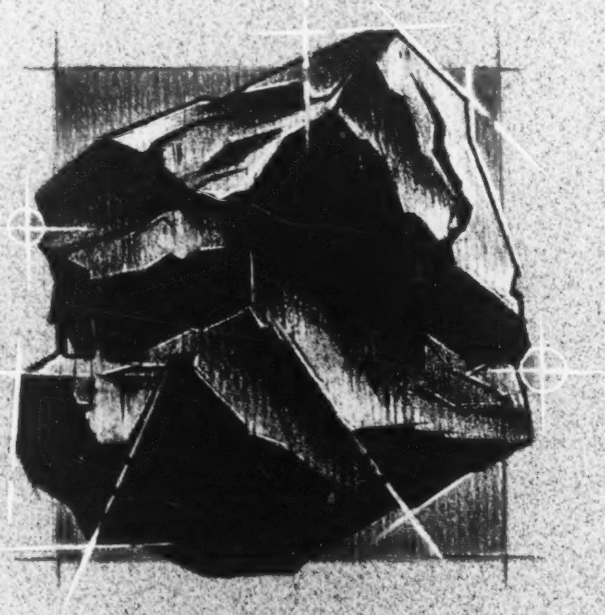

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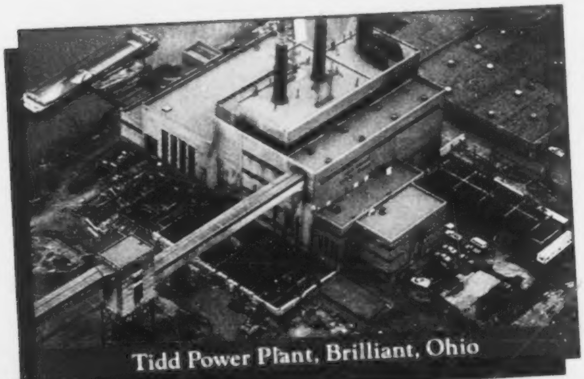
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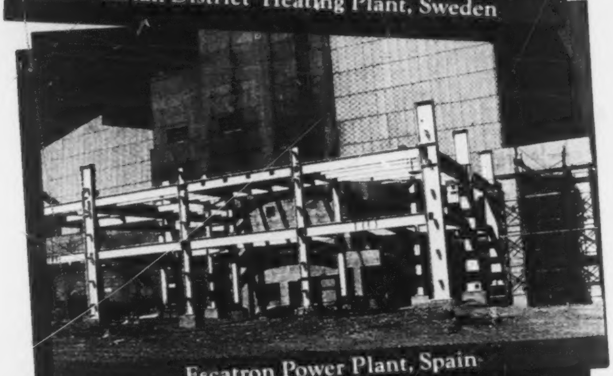
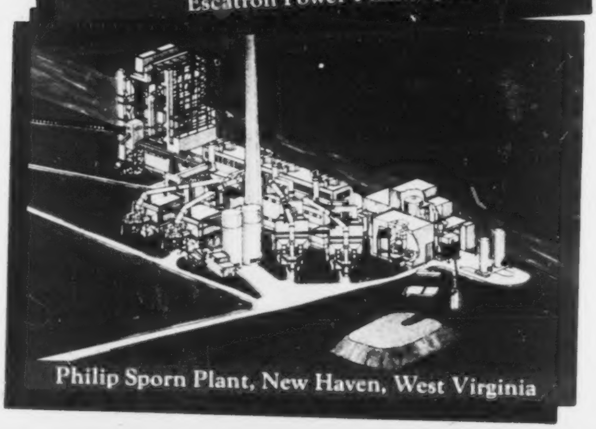
Vartan District Heating Plant, Sweden


Escatron Power Plant, Spain


Philip Sporn Plant, New Haven, West Virginia

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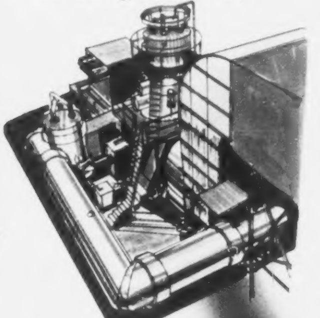

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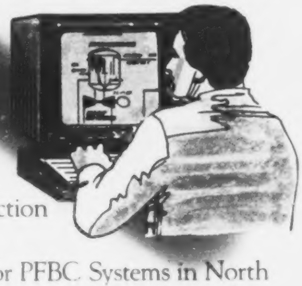

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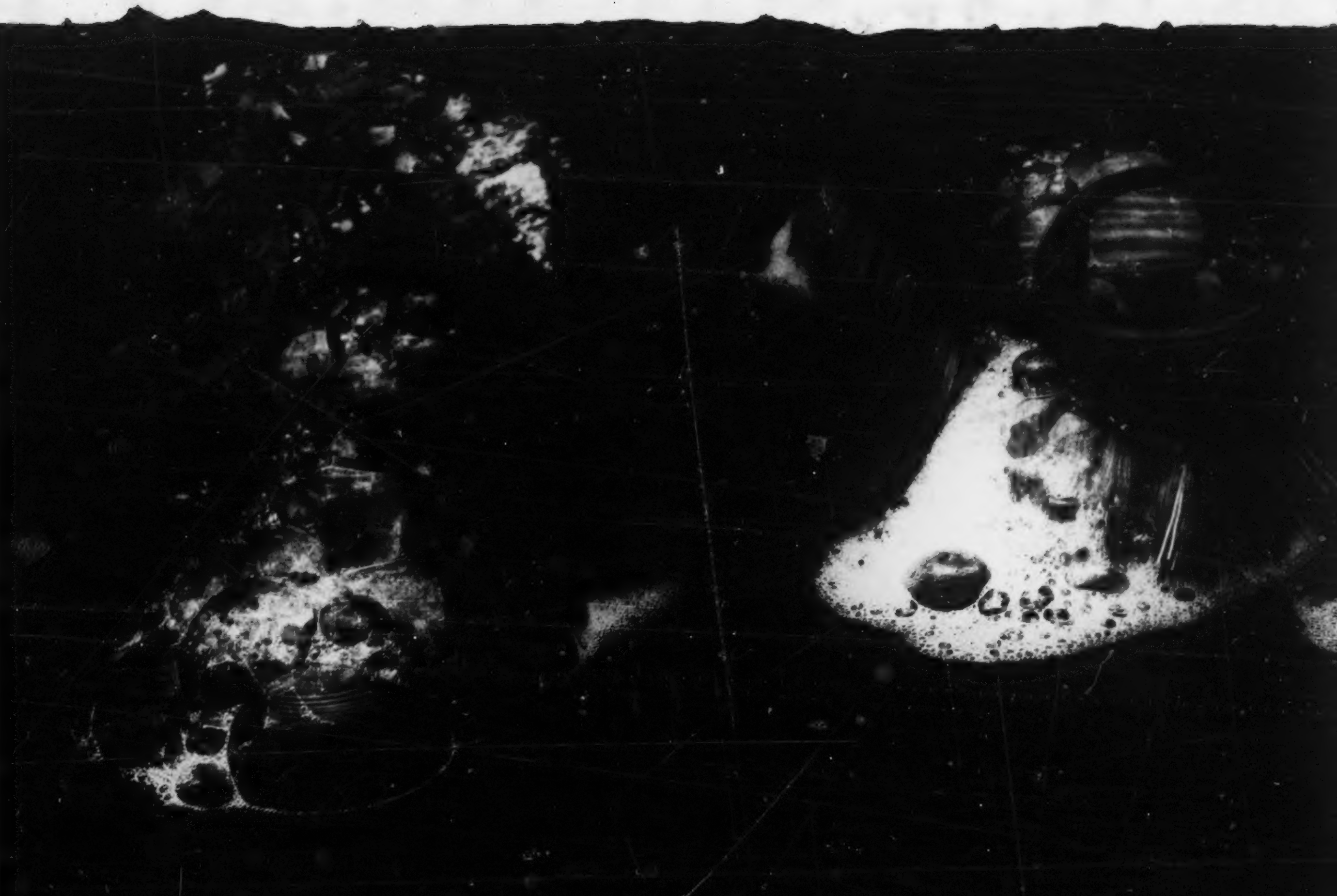

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ELECTRIC PERSPECTIVES **MAY–JUNE 1989**

SPENT NUCLEAR FUEL STORAGE: CURRENT CAPACITY AND FUTURE CONCERNS 10

Unless utilities expand their on-site storage capacity, many will run out of storage space within the next ten years.

By Donna J. Orebic

THE EMF ISSUE 24

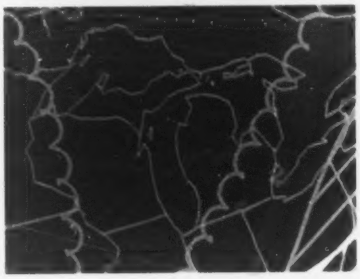
Although researchers are still looking for answers to questions about the health effects of electric and magnetic fields, public opinion and public policies are already beginning to take shape.

By Marie Mastin Newman

NATIONAL ENERGY POLICY ACT OF 1989 40

Edison Electric Institute urges the U.S. Senate to take a "holistic approach" to the issue of global climate change.

By William McCollam, Jr.



REVIEWS

STATISTICAL REVIEW 48
FINANCIAL REVIEW 49
TECHNOLOGY REVIEW 53
REGULATORY REVIEW 56

SPECIAL

SUPPLIER DIRECTORY 61

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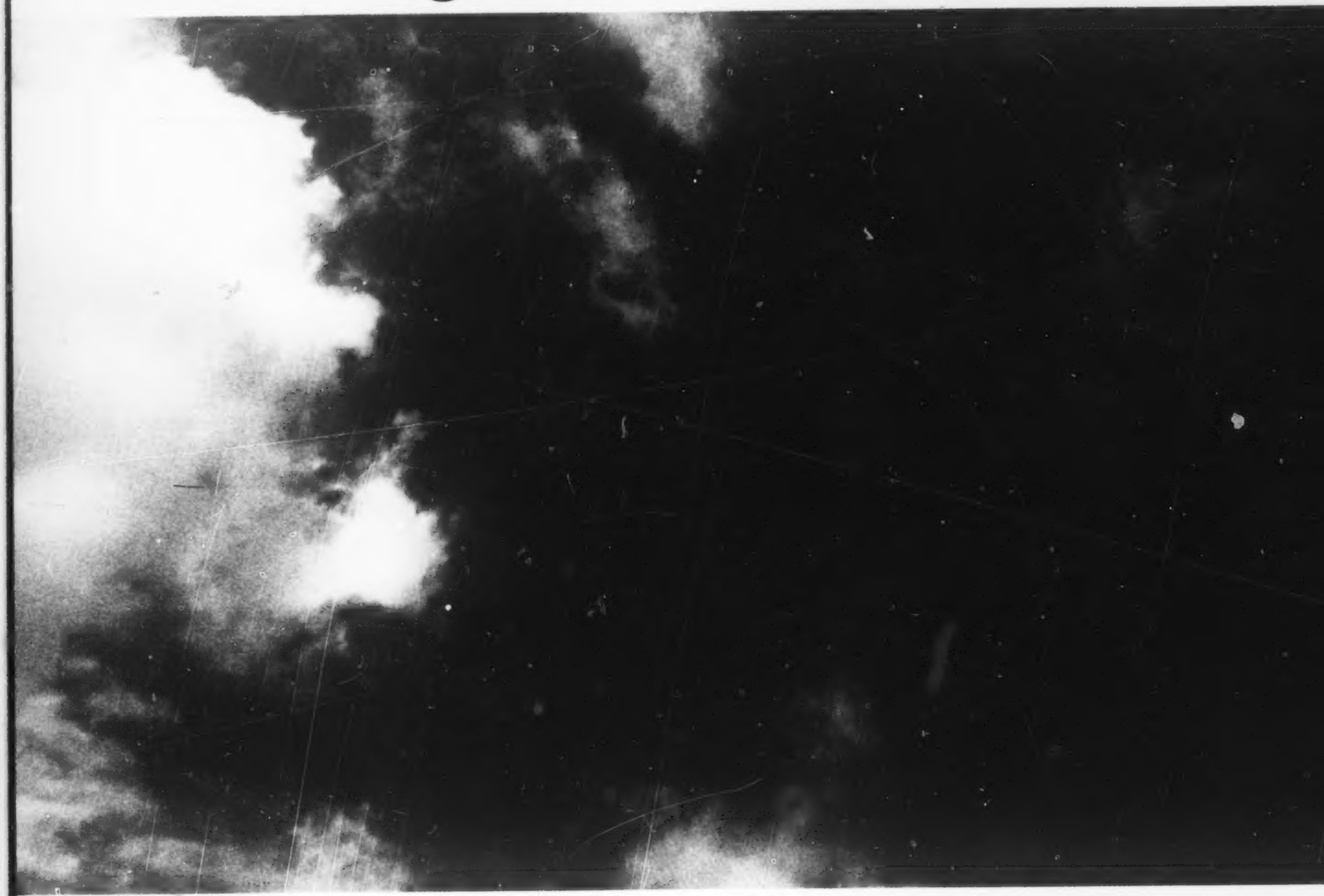

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ERSPECTIVE

Spent Nuclear Fuel Storage: Current Capacity and Future Concerns

Unless utilities expand their on-site storage capacity, many will run out of storage space within the next ten years.

Nuclear power plants generate significant amounts of radioactive waste, much of it in the form of spent nuclear fuel. As planned during power plant design, fuel assemblies that are removed from the reactor core are stored temporarily in water pools at the reactor site. At-reactor storage pools have a limited spent fuel storage capacity. These pools were originally intended to hold the spent fuel only until it could be sufficiently cooled to allow for reprocessing. After the Carter Administration instituted a ban on spent fuel reprocessing, it became apparent that the spent fuel pools would have to serve as a means of long-term storage. The at-reactor storage pools are now filling up. Unless utilities expand their on-site storage capacity, many will run out of storage space within the next ten years.

The spent fuel from commercial nuclear reactors will ultimately be disposed in a permanent geological repository. Under the Nuclear Waste Policy Act of 1982 (NWPA), the U.S. Department of Energy (DOE) is responsible for constructing and operating this permanent disposal facility. The NWPA requires DOE to begin accepting spent nuclear fuel from utilities by 1998. However, delays in DOE's repository construction program have led the agency to acknowledge that waste acceptance cannot begin in 1998. DOE currently estimates that it will probably not begin to accept spent fuel before 2003.[1]

Donna J. Orebic, a Regulatory Analyst at the California Public Utilities Commission from April 1987 to February 1989, delivered this paper at the National Association of Regulatory Utility Commissioners' Biennial Regulatory Information Conference held last September in Columbus, Ohio. Now a Legislative Aide with the San Francisco Board of Supervisors, Orebic also served on the NARUC Subcommittee on Nuclear Waste Disposal from July 1987 to February 1989 as staff representative for Commissioner Stanley Hulett of the California PUC.

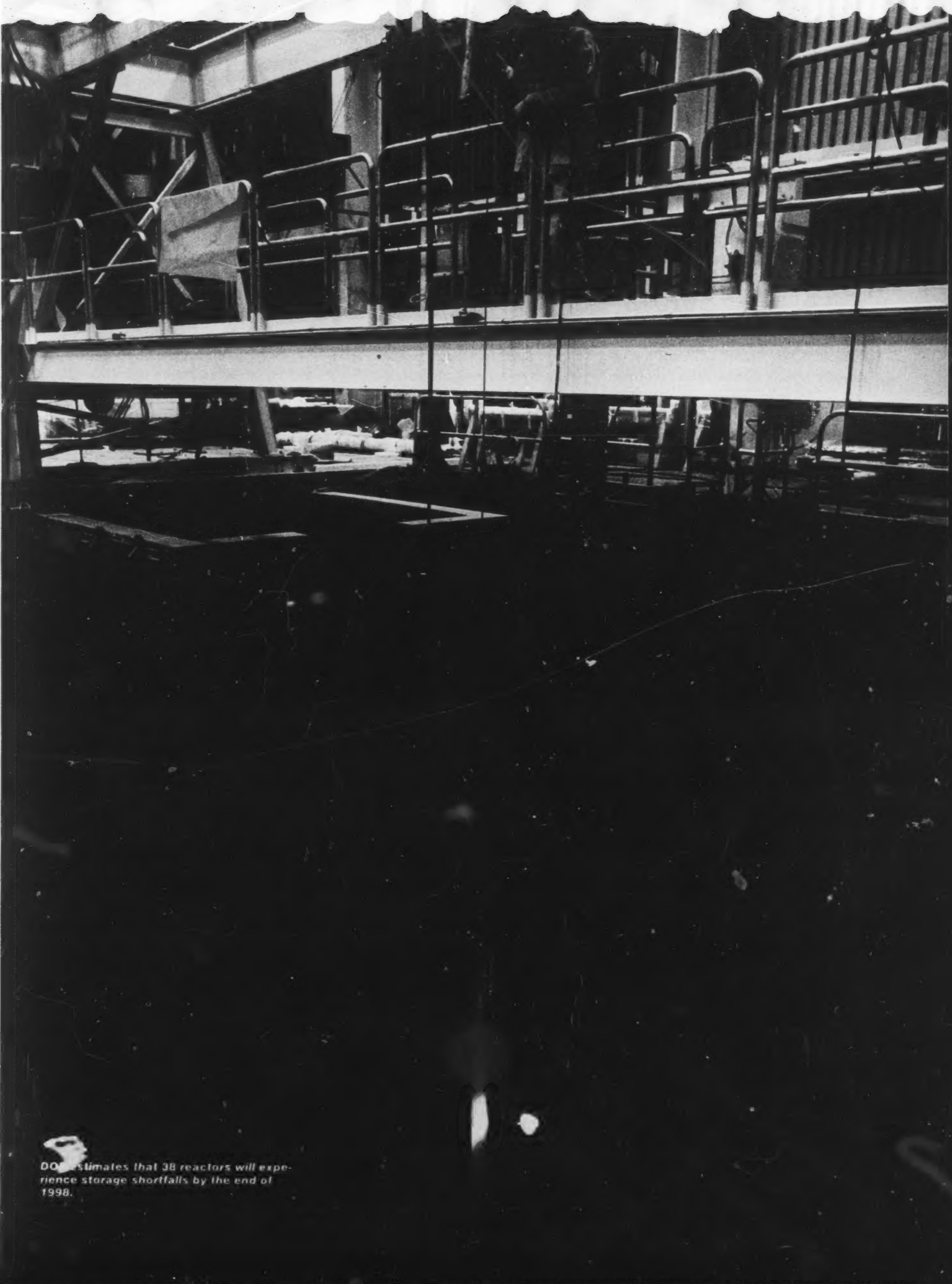
Utility customers pay a one mill per kilowatt hour surcharge on nuclear electricity to fund the federal program to develop disposal facilities for spent fuel from commercial nuclear reactors. As of May 1988, DOE had collected a total of $3.84 billion, including interest, into its Nuclear Waste Fund. The entire program is now estimated to have a final price tag of more than $30 billion. The delay in the repository construction program will not only mean a greater financial obligation from utility customers to support DOE's efforts; it will also impose an additional cost on utilities that must expand their on-site temporary storage capacity.

To appreciate the consequences of the delay in the federal nuclear waste management program, one must first determine how much additional at-reactor storage capacity utilities will need between now and when DOE begins to accept the spent fuel. The answer, of course, depends on when the permanent disposal facility will become operational and how much spent fuel it will accept on an annual basis. Finally, one must examine utilities' interim storage alternatives.

At-Reactor Storage Capacity

Two recent surveys indicate that existing at-reactor storage will be inadequate to meet future spent fuel storage needs. One survey was conducted by the National Association of Regulatory Utility Commissioners (NARUC) and the other by DOE.

In June 1987, at the request of the Executive Committee of NARUC, the Subcommittee on Nuclear Waste Disposal developed a survey of spent fuel storage at nuclear power plants. State Commissions sent the survey to all utility companies that have full or partial ownership of the more than 100 nuclear plants throughout



DO[illegible]stimates that 38 reactors will experience storage shortfalls by the end of 1998.

the country. The survey solicited three types of information: an inventory of spent fuel stored to date at each plant, an assessment of available spent fuel storage space, and a record of the amounts paid by utilities to the Nuclear Waste Fund.

The survey found that if the existing capacity of at-reactor storage pools remains unchanged, many nuclear power plants will run out of storage space before a permanent repository is available. By 1993, 28 nuclear generating units will reach their currently authorized spent fuel storage capacity. By 1998, the year the DOE is supposed to begin accepting spent fuel, 55 nuclear units will reach their currently authorized capacity. By 2003, the DOE's current target for an operational repository, a total of 78 reactors are expected to reach full storage capacity.

The NARUC survey also took into account utility plans to expand on-site pool storage capacity. Utilities may apply to the U.S. Nuclear Regulatory Commission (NRC) for permission to rerack their spent fuel pools or to store consolidated fuel. Dry cask storage is another storage expansion option available to utilities. Taking these plans into account made the future on-site spent fuel storage picture appear somewhat less bleak: 29 reactors would reach full storage capacity by 1998, and 40 reactors would reach full storage capacity by 2003.

Although many utilities reported having plans for future expansion of on-site storage capacity, these plans tended to be in a preliminary stage. Most utilities with storage expansion plans had not yet finalized the selection of a new storage technology or applied to the NRC for approval to expand at-reactor storage space. Many other utilities had no reported plans to create new storage space; the survey found this to be the case for 40 percent of the reactors that will reach full storage capacity prior to 1998.

The NARUC survey report concludes that each utility faces a spent fuel storage problem to a different degree, but that most will have to take some action to expand on-site storage capacity. The report also concludes that "the expansion of at-reactor storage facilities will in all likelihood be paid for by utility ratepayers. These costs will be in addition to the costs that are currently being paid by ratepayers into the Nuclear Waste Fund."[2]

The DOE study also documents the need for additional storage capacity. DOE issues an annual report on spent fuel storage requirements at U.S. reactors. The last such report was based on data supplied by nuclear utilities to the Energy Information Administration (EIA) as of the end of 1986.[3] This report summarizes the annual requirements for additional spent fuel storage capacity in the U.S. for the years 1987 through 2005. The requirements are given in terms of metric tons of initial heavy metal (MTIHM).

For the same key years highlighted in the NARUC survey, the DOE study shows that by 1998 there will be a storage shortfall of approximately 4,000 MTIHM. This storage shortfall will grow by the year 2003 to approximately 11,000 MTIHM. By 2005, the report projects a storage shortfall of 14,063 MTIHM; this translates to 51,308 fuel assemblies. These figures are based on utility assessments of maximum at-reactor storage capacity with allowance for maintaining full core discharge capability.

Like the NARUC survey, the DOE study also accounts for factors that could reduce the need to create additional at-reactor storage space. The study calculates additional storage requirements using the following assumptions: a) there are no constraints on transshipments of spent fuel among reactors of like type (i.e., boiling water reactors or pressurized water reactors) in a given utility system, and b) increased fuel utilization in the reactor core can lead to a possible reduction of future spent fuel discharges. The study showed that maximizing transshipment within utility systems reduced the amount of additional storage space needed for the year 2005 by 15 percent. Extended fuel exposure could reduce additional storage requirements for 2005 by 18 to 30 percent (depending on the level of exposure increase).

Although it is difficult to project the precise amount of additional at-reactor storage capacity needed to accommodate future spent fuel discharges, both surveys clearly indicate that existing pool storage capacity is inadequate. Since DOE fuel acceptance will begin at least five years behind the schedule envisioned in the NWPA, most nuclear utilities must plan to store an even larger amount of spent fuel than was anticipated subsequent to the ban on spent fuel reprocessing.

Both the NARUC and DOE surveys also calculated the total amount of spent fuel in storage pools at reactor sites. The NARUC survey revealed a total of 14,480 metric tons of heavy metal in storage as of mid-1987. The DOE study had a similar finding of 14,192 metric tons of heavy metal as of the end of 1986.

DOE's Role in Spent Fuel Disposal

The Nuclear Waste Policy Act of 1982 assigns responsibility to DOE to site, construct, and operate a geologic repository for the disposal of

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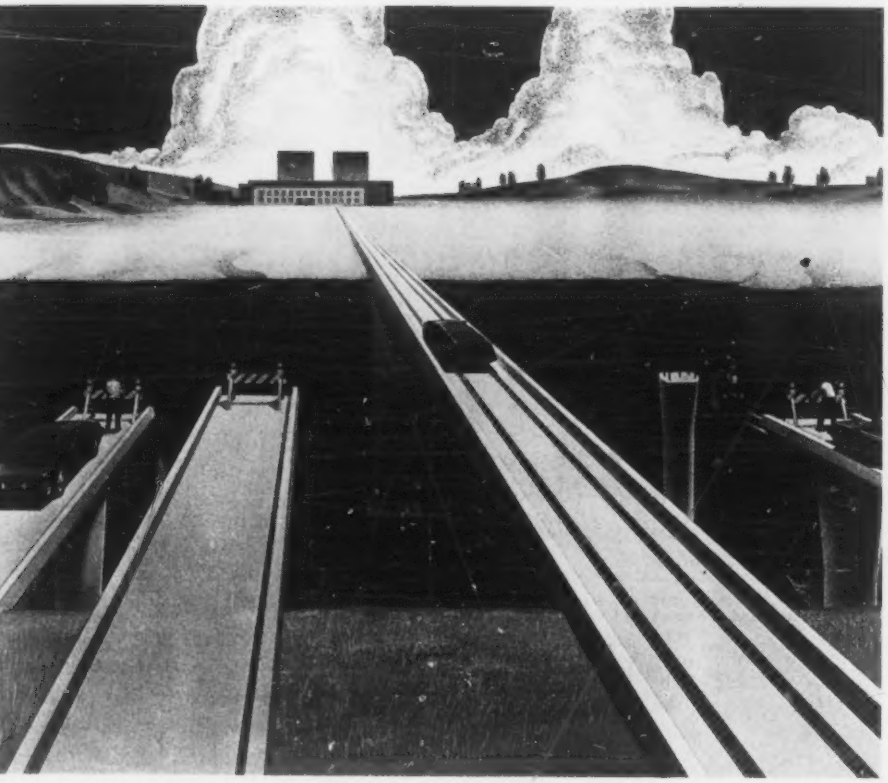

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spent fuel and other forms of radioactive waste. The original NWPA required DOE to select three sites for characterization as candidate sites for the first repository. Among other things, the NWPA also directed DOE to site a second repository and to conduct a study of the need for and feasibility of a monitored retrievable storage (MRS) facility. If an MRS facility is built, much of the spent fuel destined for disposal in a permanent repository would first go to the MRS site; the waste would be stored there on an interim basis and prepared for emplacement in the underground repository.

In December 1987, Congress passed the Nuclear Waste Policy Amendments Act of 1987 (the Amendments Act). The Amendments Act made a number of significant changes to the original NWPA, changes intended to streamline DOE's waste management program. The most important change requires DOE to characterize one candidate site rather than three for the repository. The candidate site is the Yucca Mountain site in Nevada. The Amendments Act also directs DOE to suspend all site-specific activities for the second repository. Finally, the Amendments Act authorizes the construction of an MRS facility, but prohibits construction from beginning until the NRC has issued a construction license for the first repository. This linkage is intended to prevent the MRS from becoming a long-term storage facility.

Until recently, DOE had projected that an MRS facility would be operational by 1998. The current schedule for the facility, however, provides for an operational date of 2003. This is the same year the DOE anticipates having an operational repository. The revised operational date for the MRS reflects numerous requirements of the Amendments Act linking the development of the MRS to the development of the repository. It is, therefore, unlikely, but not impossible, that an MRS could be available at an earlier date. (If a state volunteers to host the MRS or if the facility is developed in phases, there could be an earlier start-up date.) Thus, the MRS will probably not play a role in alleviating the need for additional spent fuel storage space prior to 2003. Although the facility will ultimately provide temporary storage for up to 15,000 MTIHM, the primary role of the facility will be in consolidating and packaging spent fuel prior to permanent disposal.

Table 1

Waste Acceptance Schedule
(Metric tons of heavy metal)

Year	Annual	Cumulative
2003	1200	1,200
2004	1200	2,400
2005	2000	4,400
2006	2000	6,400
2007	2700	9,100
2008	3400	12,500
2009	3400	15,900
2010	3400	19,300
2011	3400	22,700
2012	3400	26,100
2013	3400	29,500
2014	3400	32,900
2015	3400	36,300
2016	3400	39,700
2017	3400	43,100
2018	3400	46,500
2019	3400	49,900
2020	3400	53,300
2021	3400	56,700
2022	3400	60,100
2023	3400	63,500
2024	3400	65,100
2025	3100	68,000
2026	—	70,000
2027	—	70,000
Total		70,000

Source: U.S. Department of Energy, *Draft 1988 Mission Plan Amendment*, June 1988.

Another feature of DOE's waste management program that is central to the spent fuel disposal issue is the agency's waste acceptance schedule. Once DOE begins to operate a repository and an MRS facility around 2003, it will accept only limited quantities of spent fuel on an annual basis. Thus, the need for additional at-reactor storage space does not terminate with the year 2003.

Table 1 presents DOE's preliminary schedule for waste acceptance beginning with the year 2003. The schedule covers only the first 70,000 metric tons of heavy metal; this amount is the maximum limit under the NWPA for waste emplacement in the first repository. Amounts of spent fuel beyond that limit will presumably go to the second repository. Although the Amendments Act suspends site-specific work for the second repository, it directs DOE to report to Congress on the need for a second repository between the years 2007 and 2010.

DOE's preliminary waste acceptance schedule indicates that the agency will accept waste into the system in phases. Clearly, many utilities will not transfer spent fuel to DOE when facility operations commence. In fact, the preliminary schedule indicates that it will take until some time around the year 2009 for the 14,480 metric tons of heavy metal in at-reactor storage pools as of mid-1987 to be accepted into the waste management system.

In June 1987 in its first *Annual Capacity Report*, DOE published the order in which it will take title to

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spent fuel from utilities.[4] The report shows that in the first year of facility operations, the 1200 metric tons of heavy metal that will be transferred to DOE will come from 22 different utilities. The order in which DOE will accept spent fuel is based on the criterion of oldest fuel first. Barring Congressional action to accelerate DOE's program, utilities will continue to be responsible for storing their spent fuel until DOE can accept it into the system.

There are many contingencies that could affect both the 2003 operational date for the waste management facilities and the subsequent schedule for waste acceptance. One of the largest contingencies affecting the schedule for the repository is the suitability of the Yucca Mountain site. Some of the technical concerns regarding the Yucca Mountain site involve the potential for earthquakes, volcanic eruptions, and the flow of water through the unsaturated zone that would be home to the underground repository. Since the Amendments Act specifies that DOE may characterize only one rather than three sites, a negative determination regarding the Yucca Mountain site could mean a major setback for the repository schedule. DOE would then have to begin anew the lengthy site characterization process at another site.

Assuming the Yucca Mountain site is found to be suitable, DOE must still obtain a construction license for the repository from the NRC. DOE's schedule for the repository allows for three years to obtain construction authorization. The average time to license a nuclear power plant, however, is approximately five years. The NRC has already licensed over 100 nuclear power plants and by now has somewhat standardized the reactor licensing process. Unlike a proposed nuclear reactor, the permanent underground repository will be the first such facility of its kind and, hence, will require a new type of regulatory review from the NRC. Furthermore, the NRC has never before had to license a facility built by another federal entity. The interface between DOE and NRC over the licensing issue will, therefore, also constitute a new regulatory phenomenon. For these reasons, skepticism exists regarding DOE's ability to obtain construction authorization within the projected three-year time frame.

The waste acceptance schedule is also subject to various other contingencies. Although DOE has entered into contracts with utilities that provide for the acquisition, transportation, and disposal of spent fuel, the contracts contain provisions that allow DOE to adjust when and how much spent fuel it will accept. This is partly because the repository will accept high-level defense waste and other forms of radioactive waste in addition to spent fuel from commercial nuclear reactors. Thus, conflicts over the disposal of commercial spent fuel versus other types of radioactive waste requiring deep geologic disposal may arise. DOE's June 1987 *Annual Capacity Report* contains a discussion of the various contingencies that may affect the waste acceptance schedule.

Utility Response to the Growing Storage Capacity Deficit

Clearly, utilities face future deficits of spent fuel storage capacity and uncertainty regarding the time table for permanent spent fuel disposal. Most nuclear utilities must plan to add at-reactor storage capacity, but the amount of capacity to add may not be obvious. Transfers of spent fuel to the federal government already have been delayed by five years beyond the date specified by the NWPA and further delays are possible. Meanwhile, utility customers continue to support the federal waste management program through payments to the Nuclear Waste Fund. Utility customers will also have to bear the cost of creating additional on-site capacity.

For the most part, the options available to utilities with inadequate spent fuel storage capacity involve the introduction of new storage technologies at the power plants. There is not yet enough known about these storage systems to assess accurately their technical feasibility and economic impact, making it difficult for utilities to plan now for storage needs in the 1990s and beyond. Still, a review of the more promising options is instructive.

Reracking. The most common method of increasing the spent fuel storage area is to rerack the storage pool. This process involves changing the configuration of the racks that hold the fuel assemblies so that it is possible to store the assemblies in a higher density array. Reracking is the most proven and least expensive technology for increasing at-reactor spent fuel storage space. However, most utilities have already reracked their storage pools at least once, and many have done so twice. Due to structural and weight limitations of the storage pools, most utilities can no longer expand storage space through reracking.

The rest of the technologies discussed here are still in a developmental stage. Although there have been numerous demonstration projects, these technologies have not yet been approved by the NRC for general use at reactor sites; their

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future technical and economic status, therefore, remains uncertain. Preliminary cost information for the different storage technologies is given in Table 2.

Table 2

Range of Unit-Cost Estimates for Additional Storage Requirements
(Costs in dollars per kilogram of heavy metal)

Storage Technology	Unit-cost range for capacity increase of 100 MTHM	300 MTHM	1000 MTHM
Consolidated fuel stored in reactor pool	40–75	30–50	NA
Metal Cask	60–115	55–105	55–100
Concrete Cask	50–105	45–90	45–85
Horizontal Concrete Module	45–65	40–55	40–55
Modular Vault	105–155	70–105	45–70

Source: U.S. Department of Energy, Office of Civilian Radioactive Waste Management, *Initial Version Dry Cask Storage Study*, August 1988.

Rod Consolidation. In-pool consolidation involves dismantling the fuel assemblies and placing a more compact array of fuel rods into canisters that remain in the storage pool. Most demonstration projects aim for a 2:1 consolidation ratio, meaning that fuel rods from two assemblies would be stored in one canister that is the size of one assembly.

Rod consolidation is a relatively complex spent fuel storage technology; it has not yet proven to be as economical and practical a storage method as the nuclear industry previously anticipated. The target 2:1 compaction ratio for the fuel rods has proven elusive in some of the demonstration projects. Some of the concerns related to rod consolidation include its impact on spent fuel pool operations, a large personnel requirement, the appropriate storage method for the fuel assembly structures, and the ability of the pool to support the added weight of canisters containing consolidated fuel. Still, at the time the NARUC survey was conducted, rod consolidation was the preferred future method of storage expansion for utilities that had reracked their spent fuel pools to the maximum extent possible. This preference is probably because rod consolidation is a storage method that relies on the existing storage pool and is still projected to be less expensive than most forms of dry storage.

Metal Cask Storage. The most promising forms of dry storage involve the use of metal and concrete casks. Metal cask storage is less complex than concrete cask storage, primarily because metal casks can be submerged in the spent fuel pool. After the fuel is loaded into the cask, the cask is then moved to a concrete pad storage area at the reactor site. Although operationally simple, metal cask storage is one of the most expensive storage alternatives.

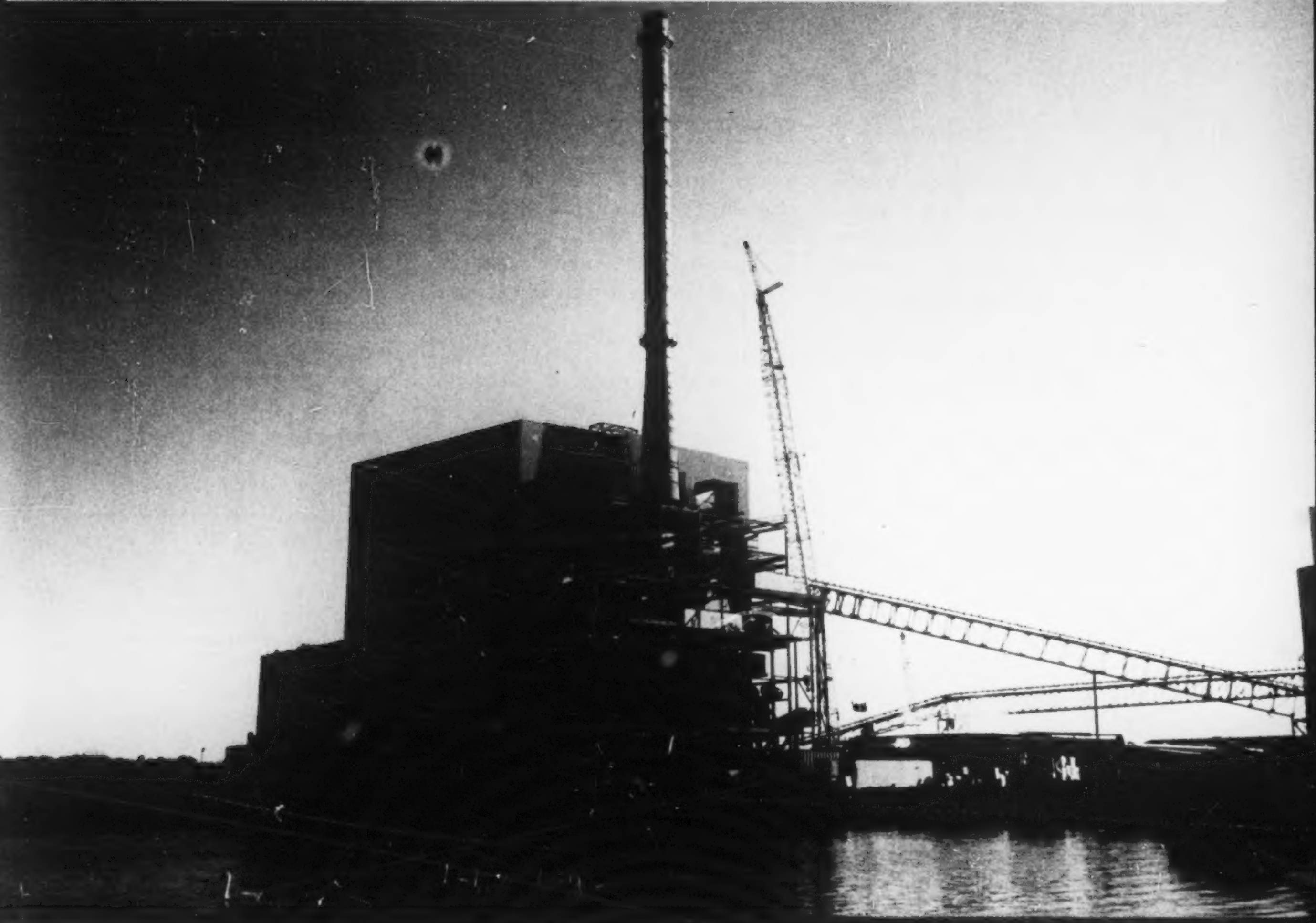
The Edison Electric Institute refers to metal cask storage as the "ultimate backup storage technology" since until now it has been the only out-of-pool storage technology that is proven and predictably licenseable.[5] The NRC has approved a number of metal cask storage designs for use at Virginia Power's Surry Power Station. Metal casks also offer the potential advantage of being useable for both storage and off-site transport. If metal casks are licensed for dual usage in the future, it will be possible to eliminate the need for spent fuel handling and the purchase of separate transport casks when utilities transfer fuel to DOE.

Concrete Cask Storage. Unlike metal casks, concrete casks (both vertical and horizontal) cannot be submerged in the spent fuel pool. Fuel is generally first loaded into a metal transfer cask in the pool and subsequently transferred to a concrete cask in a dry environment. Although it requires a larger initial equipment investment, concrete cask storage is significantly less expensive than metal cask storage.

The future outlook for storage of spent fuel in concrete casks is promising. In fact, a competitive situation has developed between the rod consolidation and concrete cask storage technologies. This is beneficial for the nuclear industry given that the technologies offer different features that can match the different storage needs and operating constraints of different reactors. For example, some utilities do not have the space at reactor sites to establish a dry cask storage area, while other utilities have pools with structural limits that preclude the storage of consolidated fuel.

Other Technologies. There are a number of other technologies for the creation of additional spent fuel storage space. These include dry wells, vaults, and supplemental storage pools. There are some major environmental concerns related to the use of dry wells and vaults. Because of such concerns, the intro-

180 MW Cogeneration



Fluidized Bed Boiler With Reheat Is First In U.S.

Reheat will be an essential ingredient of future utility size fluidized bed boilers. The future is now near New London, Connecticut, where the first U.S. application of reheat to a circulating fluidized bed boiler is under construction on a project designed by Black & Veatch.

The AES-Thames Project is a 180 MW cogeneration project of Applied Energy Services of Arlington, Virginia. It is being constructed for AES on a lump sum turnkey basis by a joint venture of Marubeni, Toshiba, and Pritchard (wholly owned subsidiary of Black & Veatch). Electricity will be supplied to Northeast Utilities and process steam will be supplied to Stone Container on whose plant site the project is being constructed.

The project includes two 672,000 pound per hour circulating fluidized bed boilers supplying steam to a single turbine-generator. Coal and limestone will be supplied by ocean-going barge and railroad. Ash will be returned to the coal mine site by the same barge-rail system. The project will begin operation in 1989.

Black & Veatch engineers shown at left are Roland Isernhagen (r.) project manager, and Ron Ott, project engineering manager.

Black & Veatch, Power Division
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duction of these technologies would probably have low political acceptability. Furthermore, there have been few demonstration projects in the U.S. involving dry wells or vaults, so at this point their costs remain uncertain. Building new storage pools is, of course, the most technically proven option, and perhaps the most politically acceptable. This option, however, is expensive, requires a long lead time for licensing and construction, and may simply be overkill for the storage needs of the plant.

SPENT NUCLEAR FUEL UPDATE

Spent Fuel Storage Deficit

DOE released the 1988 version of the Spent Fuel Storage Requirements report in October. The report, *Spent Fuel Storage Requirements 1988*, DOE/RL-88-34, is based on actual utility data as of the end of 1987 and used DOE forecasts of spent fuel discharges in 1988 and beyond. The total amount of spent fuel in storage as of the end of 1987 was 15,092 metric tons of initial heavy metal (MTIHM), with the end of 1988 amount estimated to be 17,876 MTIHM. DOE estimates that the spent fuel storage shortfall totaled over all reactor storage pools will be 2,527 MTIHM by the end of 1998, 6,015 MTIHM by the end of 2003, and 7,886 MTIHM by the end of 2005. The corresponding number of reactors with storage shortfalls are 13 reactors in 1993, 38 reactors in 1998, 58 reactors in 2003, and 66 reactors in 2005. The DOE 1988 estimates of spent fuel storage shortfalls are much lower than those given by DOE in the 1987 report. The primary reason for the decrease is the use of DOE forecasts for future spent fuel discharges in the 1988 report, whereas higher utility forecasts were used in the 1987 report. The 1988 report assumed lower capacity factors and increasing burnups, resulting in lower projections of future spent fuel discharges. The 1988 DOE estimates are in good agreement with ERI's forecasts. DOE also predicted in its 1988 report that maximizing transshipment within utility systems reduced the total storage shortfall through 2005 by 26 percent.

Effect of Additional Delays in DOE Program

The DOE high-level radioactive waste disposal program has experienced several significant delays. In November 1988, on the heels of the 1998 to 2003 delay announcement, DOE delayed for six months the start of new site characterization work, including sinking of the exploratory shafts, at Yucca Mountain due to difficulties in implementing the required quality assurance (QA) program. There is a great potential for further delays due to continuing problems with the QA program, the State of Nevada's refusal to act on DOE's application for construction-related environmental permits, litigation over DOE's selection of a management and operating contractor for the program, legal challenges on site selection, etc. This potential for additional delay raises the probability for a greater at-reactor spent fuel storage capacity shortfall. ERI estimates that by the end of 2012 the cumulative storage shortfall will be over 16,000 MTIHM, requiring additional storage capacity at 90 reactors.

DOE Program Costs

Through the end of Fiscal Year 1988, DOE collected, from electricity customers through the utilities, $4.06 billion, including interest, into the Nuclear Waste Fund (NWF). No contributions have been made by the federal government for disposal of defense high-level waste, despite a 1985 presidential decision to dispose both civilian waste and federal defense wastes in the same repository. Total expenditures amounted to $1.98 billion, leaving a FY1988 NWF balance of $2.08 billion. While DOE has yet to release a total program cost estimate based on the 1987 Amendments Act changes, the overall program costs are probably in the area of $30 billion (1988 $). Experience seems to indicate that delays increase program costs at a rate of about $500 million per year of delay.

Waste Acceptance Rate

Recent presentations by DOE to the MRS Review Commission have indicated that the startup acceptance rates for the MRS facility and the repository may be higher than those estimated in the Draft 1988 Mission Plan Amendment (1988 DMPA). Based on these recent presentations, it appears that in the first five years of operation the MRS facility might accept 2,375 MTIHM more than reported in the 1988 DMPA. The higher start up waste acceptance rates for the first five years are 1,350 MTIHM in year one, 2,025 MTIHM in year two, and 2,700 MTIHM in years three through five.

At-Reactor, Out-Of-Pool Storage Costs

The *Final Version Dry Cask Storage Study*, DOE/RW-0220, was released in February 1989. The cost estimates for the horizontal concrete module storage methodology were increased from those reported in the initial version of this report to $60/kgU-$80/kgU for a capacity increase of 100 MTIHM and to $45/kgU-$60/kgU for a capacity increase of 300 MTIHM.

Federal Interim Storage

No utilities have yet applied to DOE for the Federal Interim Storage option, and none are likely to. A recent report, *1988 Federal Interim Storage Fee Study: A Technical and Economic Analysis*, PNL-6727, estimated that the storage costs for a 1,900 MTIHM Federal Interim Storage Facility would range between $137/kgU and $175/kgU, well above the cost range of commercially available storage technologies.

—Prepared by Energy Resources International.

Most utilities facing future spent fuel storage deficits will have to implement one of these storage technologies; however, there are two other potential methods of coping with a delay in DOE acquisition of spent fuel.

Transshipment. For utilities with more than one nuclear plant and/or generating unit, it may be possible to transport spent fuel between pools to maximize use of the available pool storage space within the overall utility system. Many utilities have included transshipment in their spent fuel management plans. It is important to bear in mind, however, that transshipment is a short-term solution, one which merely delays the need for additional storage capacity. In all likelihood, the utility will still need to add new storage capacity at some later date.

Federal Interim Storage. The NWPA requires DOE to provide interim storage, upon the request of a utility, for up to 1900 MTHM. As of June 1988, DOE had not received any applications for federal interim storage, and the agency does not anticipate receiving any in the future.[6] Utilities view this option as more expensive than purchasing commercially available storage systems because utilities must pay DOE for all costs of interim storage. Furthermore, DOE cannot contract for interim storage after January 1, 1990.

Conclusion

Although future storage deficits cannot be attributed solely to the five-year delay in commencement of DOE waste acceptance, the delay has contributed to the magnitude of the storage capacity shortfall. Utilities whose spent fuel management plans relied on a 1998 operational date for the federal waste management system must now revise these plans to account for the five-year delay. Moreover, further delays in the federal program are possible given the many contingencies surrounding construction of the proposed waste facilities and the preliminary waste acceptance schedule.

> ***Building new storage pools is, of course, the most technically proven option, and perhaps the most politically acceptable. This option, however, is expensive, requires a long lead time for licensing and construction, and may simply be overkill for the storage needs of the plant.***

Most nuclear utilities will have to apply one or more advanced storage technologies to expand the storage capacity at their reactors. The economic, technical, and licensing status of these technologies still remains uncertain, however, making it difficult for utilities to plan now for future storage needs. As a number of nuclear plants face shutdown and decommissioning prior to 2003, the pressure to find solutions to the spent fuel storage problem can only increase.

Research institutes such as the Electric Power Research Institute (EPRI) and federal authorities can play a vital role in helping utilities plan for future storage needs. EPRI is playing a lead role in the research and development of alternative spent fuel storage technologies and publishes reports on each of its demonstration projects. Likewise, DOE has stated its intention to "continue working with the utilities to expedite the effective use of available storage and the development of additional storage at reactor sites."[7] Toward that end, and as required by the NWPA, DOE will soon publish a Dry Cask Storage Study. The DOE study will address the range of options available to utilities for expansion of at-reactor storage capacity.

Solutions to the lack of adequate spent fuel storage space at commercial nuclear reactors must be found. These solutions, however, will not be a substitute for the permanent disposal of spent fuel and high-level nuclear waste. Progress in the development of the federal waste management system is essential to avoid further extensions of the time that spent fuel must be stored at reactor sites.

Notes

1. U.S. Department of Energy. June 1988. *Draft 1988 Mission Plan Amendment.* DOE/RW-0187, U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Washington, D.C.

2. National Association of Regulatory Utility Commissioners. March 8, 1988. *Survey of Spent Nuclear Fuel Storage.* Washington, D.C.

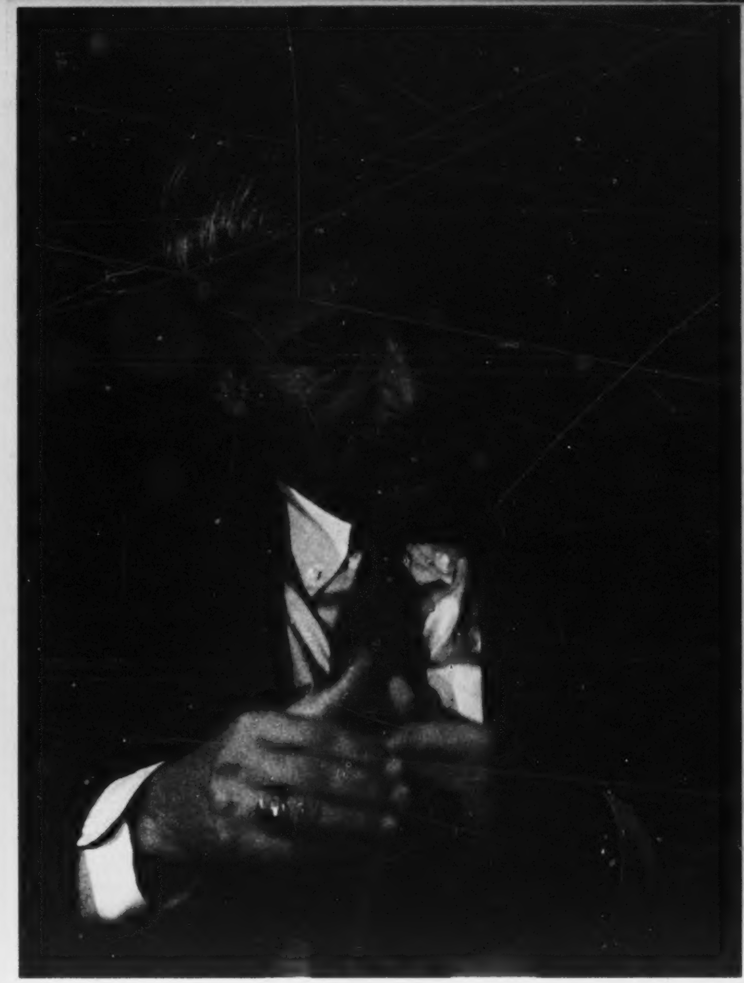
3. U.S. Department of Energy. September 1987. *Spent Fuel Storage Requirements 1987.* DOE/RL-87-11, U.S. Department of Energy, Richland Operations Office, Richland, WA.

4. U.S. Department of Energy. June 1987. *Annual Capacity Report.* DOE/RW-0146, U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Washington, D.C.

5. Edison Electric Institute. 1987. *The Status of At-Reactor Spent Nuclear Fuel Storage.* Washington, D.C.

6. See *Draft 1988 Mission Plan Amendment.*

7. See *Draft 1988 Mission Plan Amendment.*



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Marie Mastin Newman

The EMF Issue

Although researchers are still looking for answers to questions about the health effects of electric and magnetic fields, public opinion and public policies are already beginning to take shape.

The electric utility industry was caught in a storm of sensational publicity following the July 1987 release of the final report of the New York State Power Lines Project (PLP). The PLP was a 5-year, $5-million project funded by utilities in the state to investigate the health effects of electric and magnetic fields (EMF) emanating from high voltage transmission lines.

The project included 16 separate studies and most of the research showed no health effects of concern. However, one of the studies, an epidemiological study in the Denver area, reported a mild statistical correlation between EMF and childhood cancer, particularly leukemia and brain tumors. Although the researchers did *not* state that EMF *caused* cancer, and, in fact only called for more research to resolve the issue, the suggested association captured media attention and produced a torrent of emotional headlines in business, professional, and general interest publications:

"Powerlines, Pesticides Linked to Kids Cancer," *USA Today.*

"The Zapping of Post-Electrical Man," *Washington Post.*

"Electromagnetic Fields: Hidden Hazard," *Business Insurance.*

"The Price of Power: Childhood Cancer," *Parenting Magazine.*

Articles appeared in the *New York Times, The Wall Street Journal, U.S. News and World Report, Newsweek, The Economist,* and the *Journal of the American Medical Association.* The story was featured on the *Today Show* with Jane Pauley, *World News Tonight* with Peter Jennings, and on the BBC's *Panorama.* Court cases, action in state legislatures and regulatory commissions, citizen protests, and a hearing on the issue in the U.S. Congress followed on the heels of the media coverage.

Marie Mastin Newman, a free-lance writer, is author of *Health Effects of Electric and Magnetic Fields: Addressing a Climate of Uncertainty.* That report is issue number 52 in Edison Electric Institute's "Issues and Trends Briefing Papers" series. This article is an updated version of part of the 54-page report, which is available from EEI.

The EMF health issue was certainly not a new one. The utility industry, through the Electric Power Research Institute, and the federal government, through its energy and environmental agencies, had been sponsoring research examining the biological effects of fields from transmission lines since the mid-1970s. A number of other national and international entities including the National Academy of Sciences and the World Health Organization had also focused on the issue. Although the body of research had established that fields do produce biological effects, it had found no convincing evidence of harmful health effects.

Publication of the New York EMF study marked a turning point in the research, however. In light of concerns raised by the Denver study and by several other previous epidemiological studies reporting an increased risk of cancer in certain occupations, a new generation of research took root focusing on the effects of magnetic fields on human health and specifically addressing the issue of cancer. Researchers believe that this new generation of research will improve on weaknesses in past studies and will go a long way toward resolving the health questions.

Meanwhile, the drama is being played out—prematurely, some people believe—in courts of law and in state regulatory and legislative bodies. The EMF health effects issue is a highly emotional one. Although rare, childhood cancer is a frightening prospect—one that can overwhelm logic and stir leaders to action before hard scientific evidence is available. The decisions that are being made today, without hard facts, in legal, regulatory, and legislative bodies around the country, may seriously affect the way utilities do business tomorrow. Possible financial implications can be staggering. Utility managers need to be aware of developments as they unfold and to assess the situation in their own service areas in light of these developments.

Legal Actions

Four lawsuits based on *presumed* adverse health impacts of high voltage lines deserve particular attention. The most publicized of these cases is *Klein Independent School District v. Houston Lighting & Power Co., (Tex. Ct. App. 1987).* This case began as a routine land condemnation suit initiated by HL&P to acquire right-of-way for construction of a 345-kV

EMF "could explode into one of the most controversial issues faced in decades."

Pat Lanza / Folio

(kilovolt) transmission line across some property owned by Klein and on which Klein had an elementary and intermediate school and was building a senior high school. The power line was energized in 1984, but Klein and HL&P were unable to agree on the value of the land and a jury trial began in 1985 in the District Court of Harris County. Klein argued the HL&P had "grossly abused its discretion" in condemning the school district's property and brought in a number of expert witnesses to testify about the potential health hazards of EMF. The jury returned a 5-1 verdict in favor of Klein finding the HL&P had "abused its discretion" in condemning the property and ruling that the utility's conduct was in "reckless disregard" of the school district's rights. The jury awarded the school district $104,275 in actual damages (which was judged to be the value of the land) and $25 million in punitive damages.

One important point to be noted is that the jury did not rule that the 345-kV line constituted a health risk or danger to any person, student, teacher, or official of the school district, explains HL&P's senior counsel, Harris S. Leven. The question of health effects was not presented to the jury and there was no determination by the jury that the lines present a dangerous health hazard. Klein's evidence was based on the supposition that there are potential health hazards in the opinion of some individuals.

HL&P appealed the decision of the lower court to the Texas Court of Appeals and on November 5, 1987, the Appeals Court reversed the decision on the $25 million pu-

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nitive damages, while upholding the decision on the $104,275 in actual damages. The Texas Supreme Court in effect upheld the Appeals Court decision on July 6, 1988, by issuing an order refusing to hear the case. Klein filed with the Texas Supreme Court to reconsider that ruling and the matter is pending.

Two other legal cases involving the same HL&P 345-kV transmission line are also pending. The suits were filed simultaneously against HL&P on December 14, 1987, in the District Court of Harris County. *Scott, et al., v. Houston Lighting & Power Co.* is a personal injury lawsuit based on allegations by Scott that his terminal brain tumor, diagnosed in 1987, was either caused by or aggravated by EMF from the transmission line located near his home. Scott lives along the right-of-way. He alleges that the utility is liable for his health condition because it knew of potential health hazards since 1975.

Rainwater v. Houston Lighting & Power Co. was filed by Scott's sister, who sold easement rights to her property to the utility in 1980. She is charging HL&P with real estate fraud, claiming that had she known about the potential health effects, she would not have sold the rights. The cases are in the discovery stages; however, the trial dates have not yet been set by the court. The trials may not get under way until late 1989 or early 1990.

A landmark class action suit was brought against the New York Power Authority in 1987 by a group of 55 landowners in rural Orange County who are claiming that the presence of the 345-kV Marcy-South transmission line, operating since May 1987, has created a "cancerphobia" and has lowered the market value of their property. The landowners are seeking $63 million in damages. (The Power Authority had offered $400,000 based on standard land condemnation practices.) Testimony for both sides was heard in the New York Court of Claims in late September, October, and November 1988. The Power Authority submitted reviews of the literature by several prominent scientists from the National Cancer Institute and other cancer research organizations. The landowners brought in Lennart Tomenius, for example, from Sweden to testify about his study of children with cancer near transmission lines. The trial has concluded and the parties involved are now engaged in post-trial briefings.

> ***There are no federal standards limiting exposure to electric or magnetic fields from transmission lines or from any form of nonionizing radiation and there is no clear federal direction from the Environmental Protection Agency. Therefore, states are proceeding on their own.***

Regulatory Actions

Some states have taken the lead regarding regulatory actions with respect to the EMF issue. There are no federal standards limiting exposure to electric or magnetic fields from transmission lines or from any form of nonionizing radiation and, there is no clear federal direction from the Environmental Protection Agency. Therefore, states are proceeding on their own. This is a potentially difficult situation for the electric utility industry since the same battle may have to be fought 50 different times in different regulatory arenas.

At the present time, seven states have established standards for transmission line *electric* fields: Florida, Minnesota, Montana, New Jersey, New York, North Dakota, and Oregon. Florida and Oregon are the only states that have formally adopted an electric standard through the rule making process. Florida is the first state to have established a *magnetic* field standard, but New York is also moving in that direction.

New York has had an interim electric field standard since 1978. The kV per meter (m) standard at the edge of the right of way (ROW) was established by the New York State Public Service Commission at the same time that the commission issued the order creating the Power Lines Project. The standard was based on field strengths considered typical for 345-kV transmission lines at ROW. As a result of staff analysis of the Scientific Advisory Panel's final report, the PSC extended the interim electric standard and in April 1988 ordered the state's utilities to begin moving toward a magnetic field standard by initiating the following actions over a five-year period:

- To survey magnetic fields from 345-kV transmission lines in the state;
- To survey EMF exposure from

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Although the EMF issue has as much to do with household, classroom, and workplace appliances and equipment as it does electric utility facilities, power lines have become the primary focus of public concern.

overhead and underground lines in the rest of the system;

- To support research to develop methods to reduce magnetic field exposure associated with power delivery and use.

Meanwhile, the commission will develop interim magnetic field standards for future transmission lines in New York. No interim standard is expected until early 1990.

Florida, one of several bellwether states for environmental issues, became the first state in the nation with a magnetic field standard when it formally adopted rules governing both electric and magnetic fields in January of this year. The state has been actively involved in the EMF issue since 1984 when the Florida legislature gave the state Department of Environmental Regulation authority to regulate EMF. Over the past four years, two scientific panels appointed in the state have investigated the EMF health effects issue. In its 1985 report, the first panel, the Florida Electric and Magnetic Fields Advisory Commission, found no persuasive evidence of adverse health or environmental effects and did not recommend changes in utility operating procedures. However, the second group, the Electric and Magnetic Fields Science Advisory Panel, while concluding in its October 1987 report that most studies indicate no health risks, nevertheless issued several recommendations, including the establishment of interim electric and magnetic field standards. The new regulations, which cover only new lines, set electric field exposure limits at edge of ROW at 10 kV/m and magnetic field exposure limits at 200 milligaus/m (mG) for 500-kV lines. The limits are 8 kV/m and 150 mG/m at ROW edge for 230-kV lines. Special limits were established for several specific transmission line projects.

Several other state regulatory commissions have been examining the EMF issue. The Wisconsin Public Service Commission held three days of hearings on EMF in September 1988 as part of its biennial review of utility plans. According to Al Luzi of Wisconsin Electric Power Company, although the setting of standards appears unlikely at this time, the commission has been urged by farm and public interest groups to conduct research on the issue. The Texas Public Utilities Commission has established a

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task force to monitor and report back to it on developments regarding the EMF issue. And in Maryland, at the request of Potomac Electric Power Company (Pepco), the Maryland Public Service Commission in the spring of 1989 will examine again the health effects issue as it pertains to a proposed 10-mile, 500-kV line the Commission had approved in 1980. The line is one of the last unbuilt segments of a 243-mile loop spanning 10 counties surrounding Washington, D.C., and connecting the systems of four utilities. Pepco has endured 12 years of legal maneuvers by several communities that have stalled its efforts to build the power line.

Legislative Actions

In California, several legislative bodies have been involved in the EMF issue. Legislation recently signed by Governor George Deukmejian directs the State Department of Health Services and the California Public Utilities Commission to conduct a two-year research program on EMF that will be funded by California utilities. In Santa Cruz County, supervisors are requiring a land developer to take field measurements beneath three power lines that cross the property on which the developer wants to construct homes before deciding whether or not to grant him a permit to proceed. The developer filed a motion in January to require Santa Cruz either to set an EMF standard or to grant him the permit, arguing that field measurements are worthless without such a standard. The county, in turn, filed a counter-motion. As of the end of March, the issue was unresolved.

In addition, the Washington State Senate has held hearings this year to discuss two bills about EMF health effects.

While EMF has been covered by the national media, public awareness of the EMF issue is most acute on the local level. It is generally centered in the immediate vicinity of transmission line projects. In many cases, neighborhood groups have been formed to protest these projects.

Finally, on the national legislative scene, what was probably the first known inquiry by the U.S. Congress into the EMF health effects issue was held on October 6, 1987, by the Water and Power Resources Subcommittee of the House Committee on Interior and Insular Affairs. The hearing was of an information-gathering nature with a focus on the adequacy of federal efforts in EMF health research. Subcommittee Chairman George Miller (D-Calif.) presided and testimony was heard from one Congressman, six scientists, and two Federal agency representatives.

Public Perception

While EMF has been covered by the national media, public awareness of the EMF issue is most acute on the local level. It is generally centered in the immediate vicinity of transmission line projects. In many cases, neighborhood groups have been formed to protest these projects. The groups' opposition is based on a fear of health effects, concern over property values, and aesthetics/visual impacts.

On the whole, however, the general public does not seem to be overly aware of or concerned about the EMF health issue. A national consumer and public opinion survey conducted by Cambridge Reports for Edison Electric Institute in the fall of 1988 showed that the great majority of Americans (62 percent) say they have not read or heard anything about the potential health or environmental effects of EMF. Fewer than one in 20 cite cancer or birth defects as the chief hazard associated with electric power lines. More people cite electrocution or wires falling down as possible hazards.

The survey shows that presently the public does not feel threatened by EMF. Fewer than one out of four people think EMF presents a somewhat or very serious threat to health and safety. If they had to live near one of several industrial facilities, such as chemical, coal, or nuclear plants, a plurality of 37 percent say they would most prefer to live near high voltage transmission lines. The survey consisted of interviews with 1,445 persons selected to represent the U.S. population 18 years or older.

Looking at the EMF issue on a national level, media interest has diminished compared with the period following the release of the New York Power Lines Project. A number of utility officials report that the issue is not a major one in their areas. Even in Houston, which has had several legal actions, the issue does not appear to be of top customer concern, reported Floyd J. LeBlanc, staff media consultant at Houston Lighting & Power Co., at a September EEI Communication seminar.

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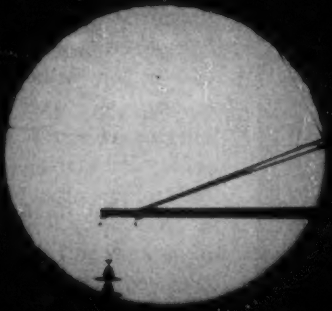

Since 1905, Ebasco has designed and constructed 25,000 miles of electric transmission lines, equaling the circumference of the earth. We have completed more fossil and nuclear facilities than any other engineering and construction firm. Our projects are notable for their exceptional schedule, budget and operating performances.

In New York, Ebasco provided engineering and project management services for the Somerset Steam Station, a coal-fired, 625-MW power plant for New York State Electric & Gas Corporation. The project came in ahead of schedule, under budget and won *POWER* magazine's 1985 Environmental Protection Award.

In Florida, Ebasco was the engineer and construction manager for the St. Johns River Power Park project for the Jacksonville Electric Authority and Florida Power & Light Company. The two 612-MW, coal-fired units came on line in 1987 and 1988, ahead of schedule and under budget and are generating electricity beyond performance specifications.

In California, Ebasco currently is modifying Southern California Edison's Ormond Beach Unit 2, a 450-MW, oil-fired plant, to improve the facility's heat rate.

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Current research into the effects of occupational exposure to EMF includes studies of telephone and electric utility linemen.

expressed overwhelming concern about possible health problems related to EMF," he said. "We receive approximately eight calls per month from customers. Most local reporters have presented the Klein case and the EMF issue in a straightforward manner." In Maryland, where Pepco has been trying to build a power line for the last 12 years, public concern is confined to the 60–100 citizens living along the proposed line and to one or two small community newspapers. The issue has not piqued the interest of the mainstream Washington, D.C., and Baltimore news media, and Pepco receives only a few calls per year about the issue and has not had any requests for speakers on the topic.

The real estate aspect of the issue is emerging. According to Edison Electric Institute's EMF issue manager Rick Loughery, most calls received at EEI now deal less with concerns about health effects and more with questions about whether power lines have any negative impacts on property values. The property value aspect is a major component of the "cancerphobia" case in New York State.

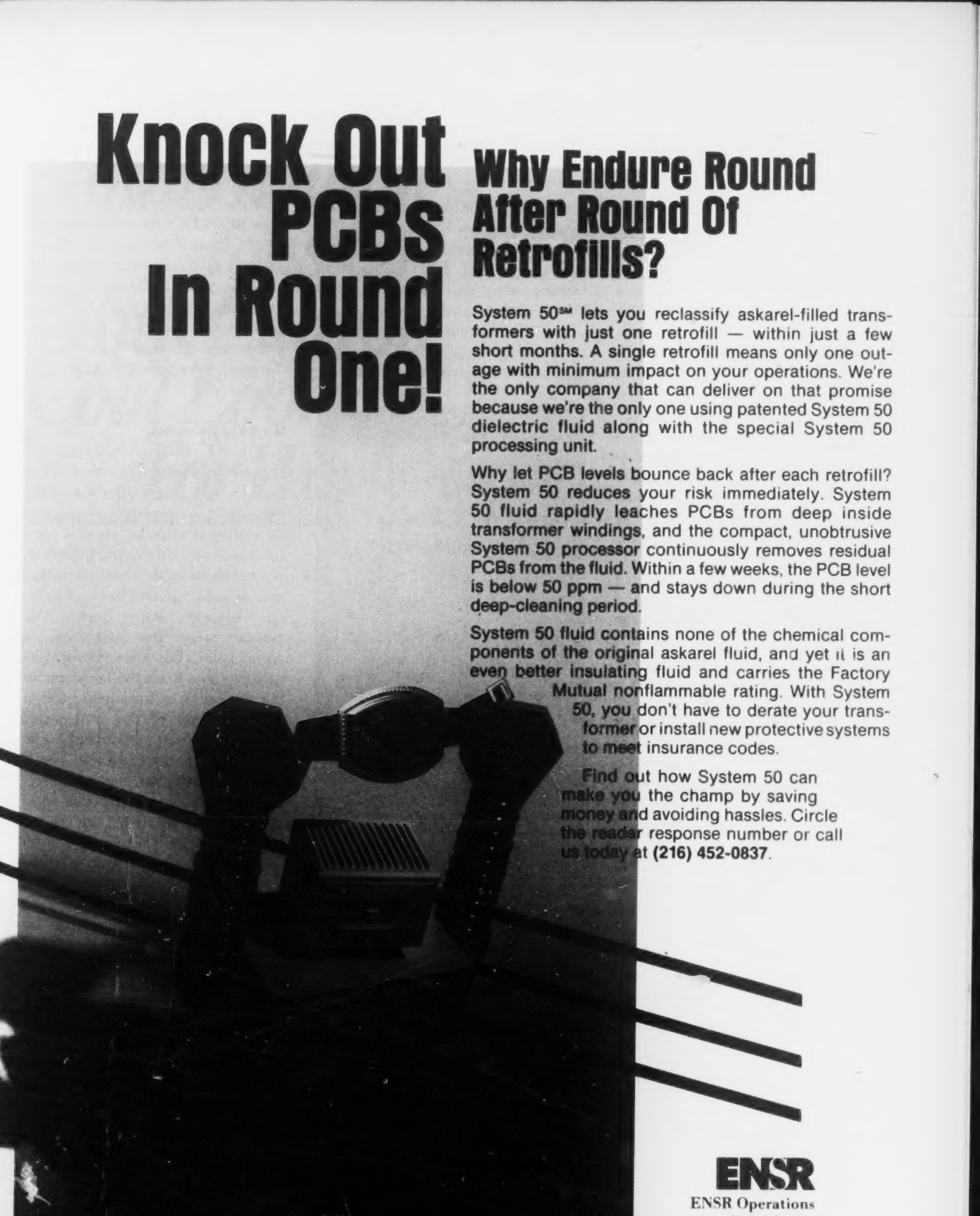
And yet most utility officials questioned agree that the issue is there, smoldering, with the potential to flare up at any time—locally, as well as nationally, when results of new research projects are announced, and locally when a utility must face a public hearing process to site new or upgrade existing transmission facilities. The issue is a good "smokescreen" for other issues, such as land values or NIMBY (Not-In-My-Backyard) sentiments and utilities are vulnerable because of the tenuous nature of the many research studies that have conflicting findings.

"The fuse is lit," stated Florida Electric Power Coordinating Group's Ron Spinka at an energy seminar in the state. And it "could explode into one of the most controversial issues faced in decades."

"Never be under-prepared for this issue," warned Media Relations Director Mark Severts of Public Service Company of Colorado at the EEI Communication seminar. "It just takes one determined individual to thrust the issue into the limelight in a public hearing process and support can be garnered quickly."

The Industry's Response

In addition to its large research effort through the Electric Power Research Institute, the electric utility industry is responding to increased concerns over EMF health effects in a variety of ways, both on a national level and within local service areas.



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Nationally, Edison Electric Institute (EEI) is spearheading a major effort to keep its member companies informed in a timely fashion on EMF research results, legal cases, and regulatory and legislative initiatives. EEI is guided in its effort by the EMF Task Force composed of 45 representatives from EEI member companies organized under the Environment and Energy Committee. The task force collects and develops background information, anticipates new developments, identifies future information needs, and provides technical expertise in matters of regulatory and industry standards.

Brendan Ware, Task Force Chairman and Manager of Electric Research and Development for the American Electric Power Service Corporation in Columbus, Ohio, sees the task force as serving as a "bridge" for information transfer from the scientists to the officials within utilities that deal with the public.

"The industry has to try to present the facts as accurately and as intelligently as it can to the public," notes Ware. Under the guidance of Ware and the task force, EEI has undertaken a number of initiatives to provide this bridge. For example,

- Establishment of the EEI EMF Health Effects Information Exchange, a monthly compilation of reports, issue briefs, and major news stories.
- Initiation of an effort to update EEI's 1984 document, "Electric and Magnetic Fields: Summary and Developments."
- Establishment of an EMF file, "EMF/Online," on EEI's electronic news and communication service, UNICOM.
- Sponsorship of a national EMF seminar in Dallas, Texas, in September 1988 for representatives of member utilities. Nearly 100 officials attended and received an issue update on EEI EMF activities; learned about regulatory and legal developments and upcoming research results; and heard a panel of five utility representatives talk about their individual programs.

> ***Nationally, Edison Electric Institute (EEI) is spearheading a major effort to keep its member companies informed in a timely fashion on EMF research results, legal cases, and regulatory and legislative initiatives.***

On a local level, utilities are taking such initiatives as preparing position papers on EMF, providing speakers for citizen meetings, and appointing an individual within the utility to be responsible for the issue. Some utilities are responding to customer concern about EMF health effects by making field measurements in residences and schools upon customer request. Utilities differ markedly in their approach to and opinion of this option. Some are adamant about *not* taking measurements for various policy and cost reasons. Some utilities take measurements and give customers written documentation; others provide the results orally. Some utilities will refer the customer to a private company that does measurements. At the EEI EMF seminar in Dallas, Texas, in September 1988, the question of field measurements was the highlight of the panel discussion on individual electric utility programs and generated considerable discussion, according to EEI's Rick Loughery.

No Easy Answers

The EMF issue is highly complicated, controversial, and emotional. It is essentially a societal, lifestyle issue, and has as much to do with video display screens, electric blankets, and electric heaters for waterbeds as it does with transmission and distribution lines, but electric utilities have become its primary target. It is a scientific and social issue. The answers will ultimately come from the laboratories, but the battle is also being fought in the courts of law and public opinion and within political bodies at the state and local level. The issue is a significant one for electric utilities, with possible serious legal, regulatory, legislative, and system reliability implications that could add up to staggering cost increases and could seriously alter the way that utilities do business.

Although the media hype has died down now, utility officials across the country warn that the "fuse is lit" and that the stick of dynamite may explode at any time. There are no easy answers and utilities will be facing the issue each time that they seek necessary state or local approval to site and construct powerlines and other transmission and distribution facilities. Utility managers who have already faced the issue in their areas stress the importance of being informed and prepared to deal with it when it does arise.

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As important as the acquisition is for P&M, we believe it is equally important for all industrial coal-users and electric utilities west of the Mississippi River.

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- The quality of York Canyon coal is superb – 12,000 BTU (up to 13,000 when washed on site) with less than one-half of 1% sulfur content. We have virtually an unlimited supply for you.
- Those who know of P&M's 104-year history will testify to both our expertise and our reputation. Like our customers through the decades, users of York Canyon's remarkable product will benefit from our time-proven leadership in managing, mining and marketing coal.
- As part of Chevron, P&M has financial stability that only America's great corporations can provide. That translates into a stability York Canyon has long deserved and which now becomes a reality. You can depend on the exact deliveries you need when you need them – now and for years to come.
- Providing complete customer service to those who use our product is paramount at P&M. Our employee longevity with the company . . . our knowledge of boilers . . . our experience in coal sampling and weighing . . . our expertise in blending and washing . . . all are indicators of P&M's commitment to meet and even exceed our clients' needs.

Naturally, the success of York Canyon under our ownership is closely linked with industries and utilities in the Southwest. But York Canyon offers a superior product for almost anyone – including Pacific Rim countries.

Environmental issues which especially threaten Midwest utilities are of concern today. Tougher clean air legislation is likely to put greater emphasis on the use of low-sulfur, high-BTU coal. P&M's York Canyon coal is sure to be a competitive player in the Midwest market.

We're excited about our latest acquisition and the promise it holds for our company and our customers. We're determined to market York Canyon coal imaginatively and aggressively . . . and we've already begun.

We'd like to tell you of the P&M commitment to customers, and what we can do for you.

After 104 years, with York Canyon in the fold, a new era has opened for P&M. We'd like you to be part of it.

R. M. Holsten President

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GE Industrial & Power Systems

William McCollam, Jr.

National Energy Policy Act of 1989

Edison Electric Institute urges the U.S. Senate to take a "holistic approach" to the issue of global climate change.

William McCollam, Jr., is President of Edison Electric Institute. This text is adapted from testimony he presented in March at the Senate Energy and Natural Resources Committee's initial hearing on Senate bill 324, The National Energy Policy Act of 1989. The omnibus greenhouse legislation is sponsored by Senator Timothy Wirth of Colorado, who hopes it will be acted on by the current Congress, and 20 others. At the hearing, general concern about global warming and agreement that action must be taken was expressed, but opinions differed considerably on various specifics of the bill. Wirth stated that he hoped the hearing "will be the beginning of a long and fruitful dialogue on energy and environmental policy."

The greenhouse effect is real. It exists. It is the reason we are able to live on our planet in relative comfort. Its existence is not in question. What is of concern is that certain societal activities may result in a significant change in the current global climate. To link any potential changes in this climate with the hot summer and drought of 1988 is not scientifically supportable. However, the electric utility industry does not intend to ignore the possibility that a warming trend may be occurring.

The Earth's temperature represents a balance between incoming solar energy and outgoing infrared radiation. The Earth's temperature is influenced by several factors, including the retention of some of the heat by atmospheric gases. It is possible that an increase in concentration of atmospheric gases which absorb the outgoing infrared radiation could result in a rise in average global temperature.

Such increases in these gases, such as carbon dioxide (CO_2) concentration, are occurring. Similarly, other greenhouse gases are increasing in the troposphere. Over the past century, data indicate an increase of about 0.5 degrees Centigrade in mean global temperature but, because of climatological variability, we are not sure if the change is within the range of normal oscillations. Some speculate that a continued increase in concentration of these greenhouse gases, however, could raise the mean global temperature by 2 to 5 degrees Centigrade within the next century or so.

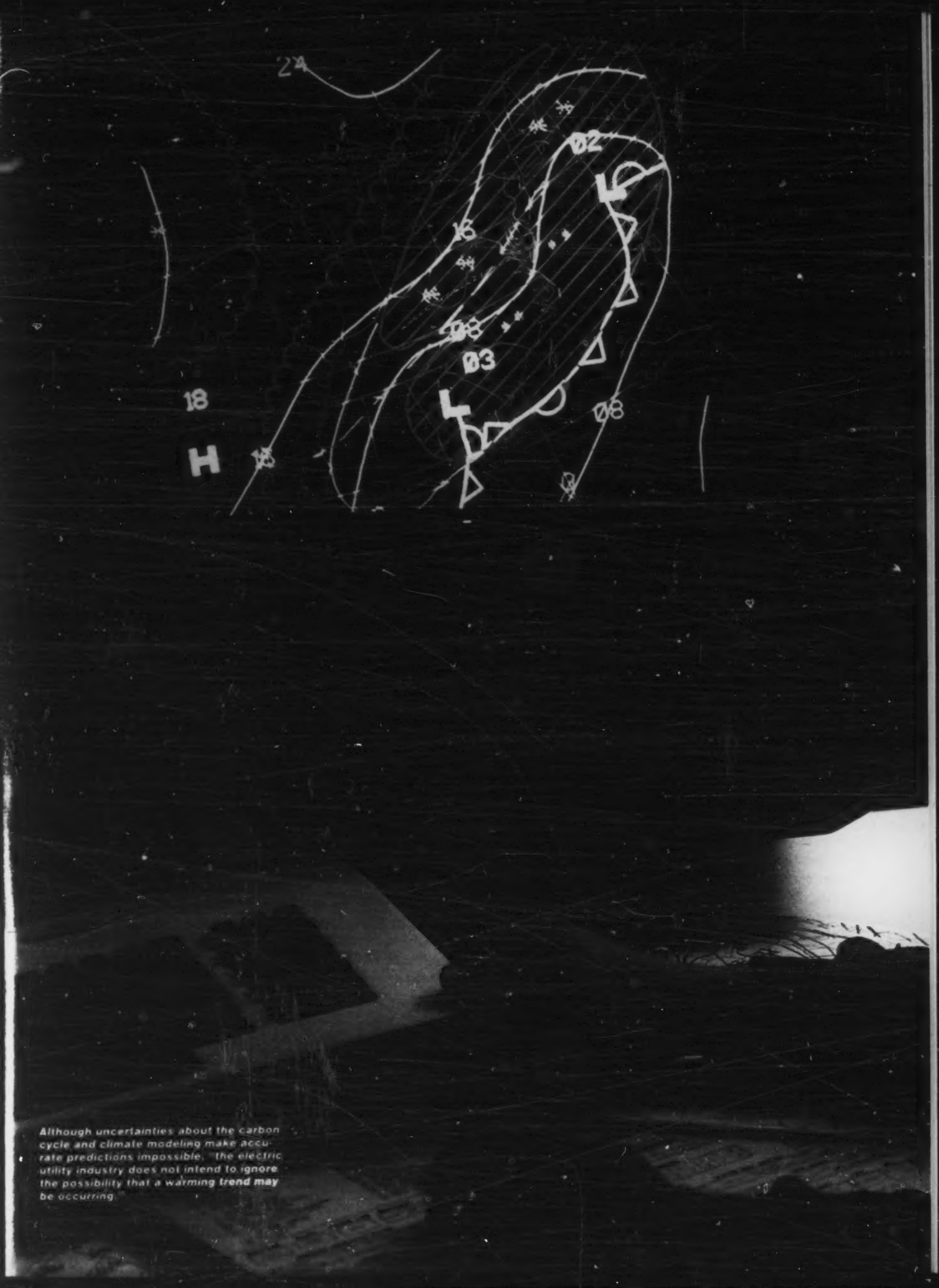
A number of gases in the atmosphere can serve as absorbers of infrared radiation. To date, CO_2 has received the most attention. In addition to CO_2, other greenhouse gases are receiving attention. Among these are nitrous oxide, methane, and chlorofluorocarbons.

Some scientists speculate that a rise in average global temperature of 4 or 5 degrees Centigrade could mean climate changes with serious societal implications. Admittedly, we are not certain what climatic changes would take place. However, we can expect that if such changes do occur, they could have significant effects on agriculture, rainfall, hydrology, sea level, storm events, demography, and human health.

Although we can envision a multitude of serious potential consequences to society, we must recognize that our knowledge is currently so limited that we cannot yet judge with any accuracy what might be the results of continued increases in greenhouse gases. We are hampered by two major uncertainties: the global carbon cycle and the modeling of global climate.

Predicting what sort of temperature changes might face the planet over the next century or so depends on several factors, including the knowledge of future atmospheric concentrations of greenhouse gases. Future CO_2 levels depend on factors which, at best, are difficult to quantify, such as land use, atmospheric retention of emitted CO_2, fuel use, and energy growth. These contributing factors, in turn, are dependent on others, most of which are fraught with a high degree of uncertainty.

Worldwide CO_2 emissions increased from about 1.6 billion tons in 1950 to about 5.1 billion tons in 1980. The North American share of these emissions decreased from about 45 percent of the total in 1950



Although uncertainties about the carbon cycle and climate modeling make accurate predictions impossible, "the electric utility industry does not intend to ignore the possibility that a warming trend may be occurring."

to about 25 percent of the total in 1980. Projections into the future show further decreases in the North American percentage. According to the Electric Power Research Institute, by the year 2000 North American sources will account for only about 15 percent of the total worldwide CO_2 emissions. These projections take into account the rapidly increasing population and energy use in developing countries and increased industrialization in the Soviet Union and Asia.

All of this is not to suggest that rational public policy cannot be crafted to address the issue. We strongly advocate a holistic approach to the issue. Our industry strongly supports rational energy policies that address global environmental issues by encouraging international cooperation and by contributing to the development of a diversity of energy sources. The electric utility industry is aggressively pursuing several paths which are designed to meet the nation's energy needs while reducing atmospheric emissions.

In fact, we are in the process of preparing a set of policy recommendations to be released shortly, and a good many of these recommendations are consistent with the approach taken in various sections of S.324. While most of this forthcoming report will focus on future capacity needs, the recommendations which will be presented are entirely consistent with the extensive efforts by electric utilities to promote energy efficiency.

In this report, the promotion of energy efficiency as a matter of national policy in all sectors of the economy is given first priority. It is important to underscore—in the strongest possible terms—that this industry, its customers, and its regulators have combined to achieve substantial improvements in the efficient production and use of electricity, and that energy efficiency plays a crucial role in our industry's strategies for an adequate, reliable, affordable, and environmentally sound electricity supply for the future.

All of this is not to suggest that rational public policy cannot be crafted to address the issue. We strongly advocate a holistic approach to the issue. Our industry strongly supports rational energy policies that address global environmental issues by encouraging international cooperation and by contributing to the development of a diversity of energy sources. The electric utility industry is aggressively pursuing several paths which are designed to meet the nation's energy needs while reducing atmospheric emissions.

The history of this industry clearly demonstrates our long-term commitment to energy efficiency. As an example, the number of utility-sponsored programs designed to increase customer end-use efficiency has increased from about 134 in 1977 to nearly 1,300 today. These efforts cover all market sectors in a wide variety of ways. They range from the provision of informational materials for customer use to direct control of customer loads. They run the gamut from mass media advertising to on-site energy audits. They include incentives ranging from alternative pricing structures to direct cash rebate payments for the purchase of high efficiency end-use equipment, zero or below-market interest rate financing of efficiency improvements, shared savings programs, direct marketing of new efficiency technologies, construction design assistance and guidelines, irrigation pump testing, re-lamping programs, and many others. This listing is incomplete but is, nevertheless, illustrative of the broad range of activities by which we aggressively seek to improve energy efficiency. The electric utility industry now spends in excess of $1 billion per year in support of these efforts, and the amount continues to increase.

The result of these efforts is no less impressive. The capacity savings which are a direct result of these efforts since 1977 are estimated at more than 21,000 megawatts to date and are projected to exceed 45,000 megawatts by the year 2000. If one were to assume a very conservative construction cost for new capacity of $1,000 per kilowatt, this means that something on the order of $21 billion of new investment has been avoided so far and as much as $45 billion will be saved by the year 2000.

By any rational standard of judgment, this record of accomplishment is indicative of a serious and long-term commitment to energy efficiency. Further, electric utilities continue to work closely with our state regulatory commissions and our customers to find ways in which energy efficiency and load management programs can be improved.

This means development of new and more efficient end-use applications, as is done at the Electric Power Research Institute, backed by industry-wide funding. It means our industry's continued support for such sensible legislation as the National Appliance Energy Conservation Act of 1987 to produce greater gains in efficiency. It means continued support from state commissions to permit utilities the flexibility to conduct pilot programs tailored to local needs which hold the promise of an increased range of services available to customers in all market segments. It means the adoption of such model energy codes as the one recently promulgated by the Council of American Building Officials for new construction. Finally, it means sound public policy in light of growing public concern over possible global climate change.

Conservation, the efficient use of fossil fuels, the development of renewable energy sources, and use of nuclear power all must be considered simultaneously as there is no one single answer which satisfactorily addresses issues of global climate change, energy supply, national security, international competitiveness, economic health, efficiency, productivity, and the quality of life. Policies which solve one problem at the expense of another should not be tolerated. For example, to mandate flue gas scrubbers to remove sulfur dioxide would increase emissions of CO_2.

In 1988, less than 8 percent of the world's CO_2 was emitted by the U.S. electric utility industry. If we were to assume that this level went to zero immediately, the result would be that the much-discussed doubling of CO_2 in the atmosphere to the 600 parts per million level would be slowed by some 3 to 5 years. On the scale most frequently discussed, 50 to 100 years, this delay is almost inconsequential. Based

SOME COMPANIES TREAT THEIR CUSTOMERS BETTER THAN OTHERS.

S. 324: THE NATIONAL ENERGY POLICY ACT OF 1989

Aimed at reducing carbon dioxide emissions by 20 percent by the year 2000, The National Energy Policy Act of 1989 is far-reaching. It deals with nuclear power, energy efficiency, natural gas use, basic research, and population control. Its estimated costs are $4.9 billion for the first three years. Among the bill's provisions are the following:

- DOE and EPA would be required to develop a "Least-Cost National Energy Plan" to meet the 20 percent reduction goal. The Plan would outline policies for conserving fossil fuel energy and for expanding use of renewable energy sources to meet energy demands without exceeding CO_2 emissions levels outlined in the bill.
- Funding is provided for R&D on second-generation nuclear reactors that would be passively safe and modular. Funding levels are $100 million in fiscal year 1991 and not more than $200 million for each of fiscal years 1992 and 1993. (This compares with approximately $286 million earmarked for advanced civilian reactors in fiscal year 1989.) A DOE report on international fusion programs also is requested.
- Energy efficiency and renewable energy are emphasized. PURPA would be altered to require utilities to purchase "qualifying conservation," based on the QF model. The ban on the sale and installation of energy conservation measures by utilities would be lifted.
- Eight regional centers for the development of more energy efficient industrial processes, as well as other efficiency R&D projects, would be established. State energy conservation programs established in the 1970s would be revitalized, with new energy conservation targets set. New State Energy Advisory Boards would be created to recommend programs and policies to achieve energy conservation goals and to coordinate state and federal efforts.
- An Office of Climate Protection would be created to monitor U.S. energy policy for atmospheric and global warming effects. DOE would be charged with developing a comprehensive report on the implications of the Clean Coal program for CO_2 generation and global warming.
- $100 million is provided for a demonstration project on the feasibility of using natural gas as a fuel for mass transit systems and training programs for conversion of gas and diesel-fueled vehicles to natural gas. The program also encourages demonstration of high-efficiency heat engines for generating electricity.
- Funding for basic research is provided to the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, and the U.S. Geological Survey. Over $1.5 billion is earmarked for international family planning services between fiscal years 1991 and 1993. The Agency for International Development is directed to develop conservation programs for tropical forests in less developed countries and to encourage private investment in energy-efficiency technologies in those countries.

on the results of an admittedly extreme case not contemplated by S.324, we believe that any plan calling for urgent and extreme action to reduce utility CO_2 emissions is premature at best. We believe it proper to advocate increased electrification, conservation, and energy efficiency while continuing to increase our scientific knowledge base on the issue. For example, we support legislation such as S.251, which calls for scientific assessment of global environment and climate change. In addition, EEI has just undertaken a macro review of the impacts of increased electrification for the industrial and transportation sectors.

As you can see, we are not suggesting inaction. Quite the contrary. There is much in this bill worthy of support and implementation. However, there are some provisions of the bill which merit further scrutiny. For example, in order to attempt a 20 percent reduction of CO_2 emissions, the bill envisions the creation of a National Least-Cost Energy Plan by the Secretary of Energy and the Administrator of the Environmental Protection Agency in a scant 18 months. The content of the Plan as described in the proposed legislation is exhaustive, to put it mildly. According to a recently published study by the Electric Power Research Institute, electric resource planners in nearly every state either now use or are actively considering some form of what has become known as Least-Cost Planning. At least 43 states have functioning strategies in this area or are considering, developing, or implementing a process designed to attempt to find the most cost-effective mix of new generating facilities and demand-side management. It is an understatement to say that this complex and difficult work has taken much time and significant resources, and yet the definition of the term "least-cost" is still a matter of much debate and discussion with at least as many definitions as there are debaters. The proposed legislation is silent on this matter. We would support the development of a national energy plan which suggests an appropriate balancing of supply, demand, financial, and environmental concerns but believe Title I of the bill could use much more refinement and a more reasonable time frame.

The section of the bill calling for a reduction in energy use per unit of GNP of 2 to 4 percent *per year* through 2005 should be revisited. On the surface, this does not sound like such a terribly large reduction. Upon closer examination, however, it turns out to be a staggering amount of energy. Assuming all goes according to the timetables laid out in the bill, the reductions would have to begin in 1991. At the 2 percent rate of reduction, energy use per unit of GNP would have to be down by a total of 32 percent by 2005, and at the 4 percent rate, energy use per unit of GNP would have to be down by some 73 percent. By comparison, from 1973 to 1988 energy use per unit of GNP declined by 27 percent. One either has to assume energy use will remain unchanged and the economy will expand beyond reasonable projections, which is hardly sound reasoning, or one must assume a near tripling of energy efficiency by this measure, which suffers the same deficiency. In any case, this provision is simply unrealistic.

For some years now, federal, state, and local governments along with energy suppliers of all types have struggled with the concept of some sort of residential energy rating system which could be applied fairly to all residential housing units, both new and old. The effort has been notable in its lack of success. Aside from fuel bias, perhaps the thorniest problem has been the application of the various systems to existing structures. Unfortunately, the costs associated with bringing an older residence up to new specifications are generally very high, and the market for such residences generally consists of those with limited means. The result is a kind of de facto "red-lining" which has the unintended effect of discrimination. Clearly more work must be done in this

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area, but there is no reason to delay adoption of a standard for new construction. I earlier referenced our support for the recently promulgated Model Energy Code of the Council of American Building Officials. This consensus standard improves the energy efficiency of new structures when compared with the existing base. Under the provisions of Public law 678, the General Services Administration, the Department of Defense, the Department of Housing and Urban Development, and the Department of Energy are all scheduling rulemaking proceedings concerning the adoption of this Model Energy Code. Thus, a firm standard now exists for new construction, and the process of adoption has begun. We would suggest that while work proceeds on a system for existing housing, adoption of this standard for new construction would be of immediate benefit.

Certain sections of the proposed legislation would amend the Federal Power Act and the Public Utility Regulatory Policies Act (PURPA) so as to create least-cost investment standards, qualifying conservation, and qualifying conservation entities. Our industry's position here is one of concern that consumers do not end up paying twice for conservation and demand reductions. Customers installing conservation or load management equipment receive an immediate benefit from reduced power consumption and a corresponding reduction in the cost of electricity. In addition, as I mentioned earlier, utilities often encourage such actions by making a one-time payment to customers installing such equipment or offering very favorable financing terms. It would be inappropriate to consider demand-side measures a second time as part of an all source competitive bidding. Consideration of the level and type of demand-side subsidies to customers necessarily involves a cost-benefit analysis and assessment of the impact on participating and non-participating customers. Utilities make these assessments, often under state commission guidelines. In system planning, it is customary to treat the load impacts of demand-side measures as deductions from a load forecast made without assuming new demand-side measures. This procedure avoids confusing the utility's cost-benefit assessment with treating demand-side megawatts as a direct substitute for supply-side megawatts. We have strongly advised the Federal Energy Regulatory Commission against treating them as equivalent and make the same recommendation here.

Finally, we would urge the federal government to promote and support international cooperation and to encourage all nations to take responsibility for safeguarding the Earth's environment. Acting alone will not significantly reduce future emissions. Dictating policy to developing countries is most certainly not the answer. Since any effects which might occur will be global, activity on the issue should be global as well.

We are also concerned that S.324 may permit qualifying facilities to compete as qualifying conservation entities. This raises serious conflict of interest concerns which could be detrimental to electric consumers and the general objectives of the bill. In addition, the bill would require utilities to purchase from qualifying conservation entities. We believe this will be unnecessary given the new PURPA standards created by the bill and its repeal of Section 216 of the National Energy Conservation Policy Act. It could lead to wasteful duplication of effort and increased cost to the customer. The provision should be amended to provide merely that state commissions may, to the extent they find it necessary to achieve the bill's conservation goals, require such purchases.

Finally, we would urge the federal government to promote and support international cooperation and to encourage all nations to take responsibility for safeguarding the Earth's environment. Acting alone will not significantly reduce future emissions. Dictating policy to developing countries is most certainly not the answer. Only by working together can we address this issue. Since any effects which might occur will be global, activity on the issue should be global as well. For our part, through EEI, the electric utility industry intends to open direct lines of communication with energy suppliers around the world to facilitate participation in programs designed to meet the growing energy demands while protecting the global environment. EP

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STATISTICAL REVIEW

1988 ELECTRICITY SALES UP 4.9 PERCENT

Total electricity utility industry sales in 1988 reached 2,549 billion kilowatthours, an increase of 4.9 percent over 1987. Investor-owned utilities accounted for 70.2 percent of the total sales. (See Table 1.)

Residential sales for 1988 increased 4.7 percent while revenues rose by 5.3 percent. The increases are attributed to improved economic conditions, growth in the number of residential customers, extreme weather conditions during the first and third quarters of last year, and stable residential electricity prices.

The combined commercial/industrial classification registered a strong sales increase of 5.0 percent while revenues increased 4.1 percent. Increased industrial output and lower electricity prices for the two classes resulted in a slight decrease in the average annual revenue per kilowatthour sold.

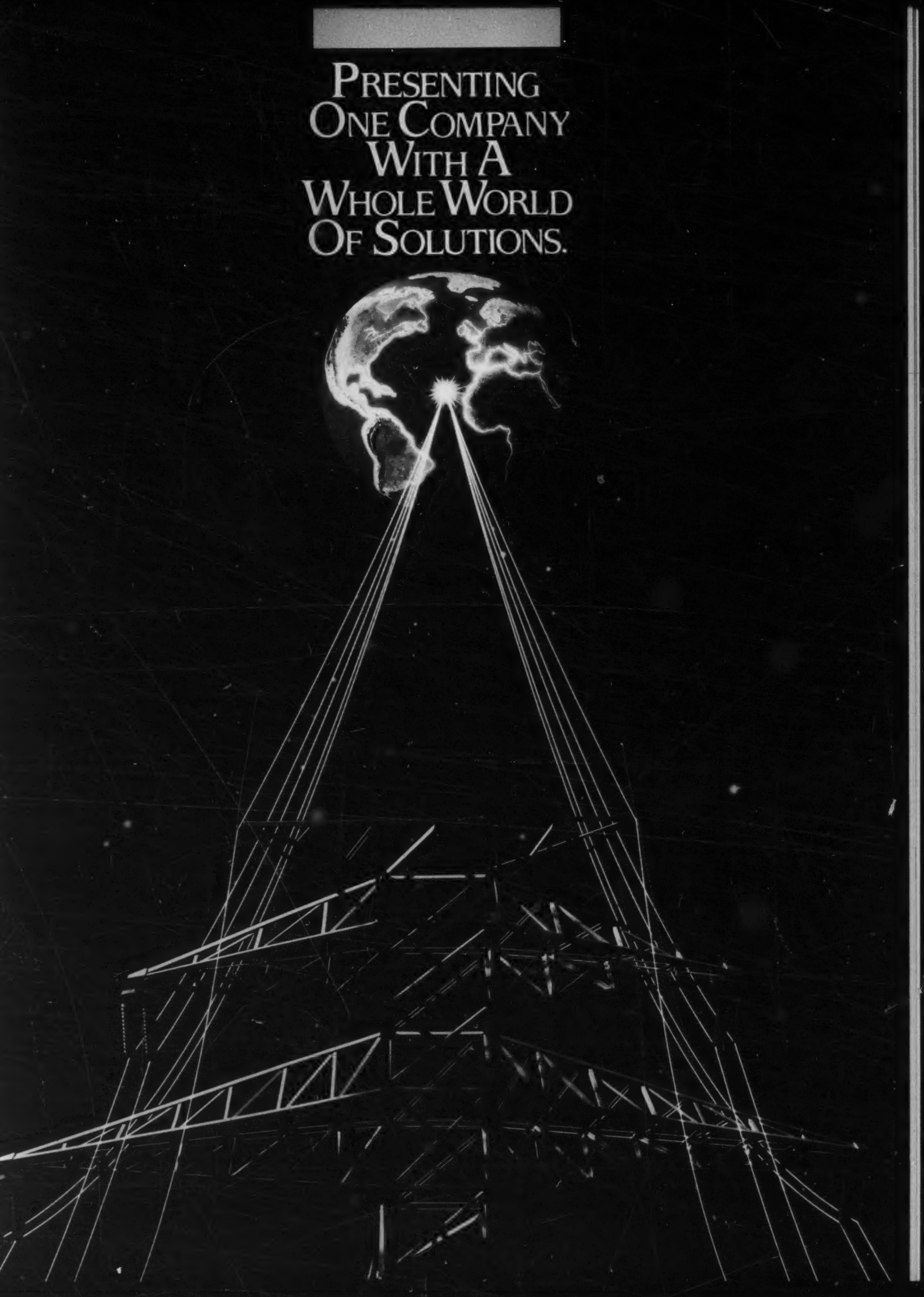
Because of the high-demand for electricity during the first and third quarters of 1988, the percentage increase in sales for 1989 may not be as high. The main factors determining sales are weather conditions and economic trends. If normal weather conditions exist and the projected modest slowing of economic growth materializes in 1989, electricity sales could show a moderate growth rate. Electric output, an early indicator of electricity sales, is up 2.4 percent for the first 10 weeks of 1989 over the same period last year. ≡P

Contributed by Edison Electric Institute's Statistics Department.

Table 1
Electric Utility Industry Customers, Sales, and Revenue Data for 1987 and 1988

	Total Electric Utility Industry			Investor-Owned Utilities		
	1988 P	1987 R	Percent Increase	1988 P	1987 R	Percent Increase
Number of Customers (Average)						
Residential	93,598,371	91,566,719	2.2	71,404,514	70,155,394	1.8
Commercial	11,587,177	11,244,809	3.0	8,902,750	8,672,008	2.7
Industrial	506,093	497,507	1.7	370,107	363,041	1.9
Street & Highway Lighting	169,506	166,602	1.7	130,717	128,123	2.0
Other Public Authorities	187,192	184,328	1.6	150,706	147,162	2.4
Railroads and Railways	28	28	0.0	22	21	4.8
Interdepartmental	2,001	2,112	(5.3)	451	427	5.6
Total Customers	106,050,368	103,662,105	2.3	80,959,267	79,466,176	1.9
Electricity Sales (Megawatthours)						
Residential	885,075,429	845,068,963	4.7	647,564,644	618,494,711	4.7
Commercial	696,399,962	656,708,012	6.0	575,142,180	544,615,781	5.6
Industrial	878,475,886	842,680,355	4.2	686,221,028	658,417,055	4.2
Street & Highway Lighting	14,723,806	14,541,819	1.3	10,399,145	10,396,907	0.0
Other Public Authorities	65,302,384	62,821,312	3.9	44,456,975	43,195,573	2.9
Railroads and Railways	5,061,183	4,878,178	3.8	2,399,273	2,239,293	7.1
Interdepartmental	4,169,717	4,493,389	(7.2)	1,875,984	2,199,825	(14.7)
Total Sales	2,549,208,367	2,431,192,028	4.9	1,968,059,229	1,879,559,145	4.7
Revenues (Thousands of Dollars)						
Residential	66,271,352	62,951,554	5.3	50,440,899	47,961,940	5.2
Commercial	49,113,321	46,604,260	5.4	41,189,592	39,437,161	4.4
Industrial	41,790,180	40,725,354	2.6	32,878,845	32,110,715	2.4
Street & Highway Lighting	1,511,011	1,508,199	0.2	1,180,852	1,198,409	(1.5)
Other Public Authorities	3,302,023	3,244,814	1.8	2,345,231	2,320,749	1.1
Railroads and Railways	308,989	301,048	2.6	150,236	147,336	2.0
Interdepartmental	170,915	187,990	(9.1)	116,180	136,454	(14.9)
Total Revenues	162,467,791	155,523,219	4.5	128,301,835	123,312,764	4.0

( ) Denotes negative number.
P = Preliminary.
R = Revised from data published in the Statistical Yearbook of the Electric Utility Industry/1987.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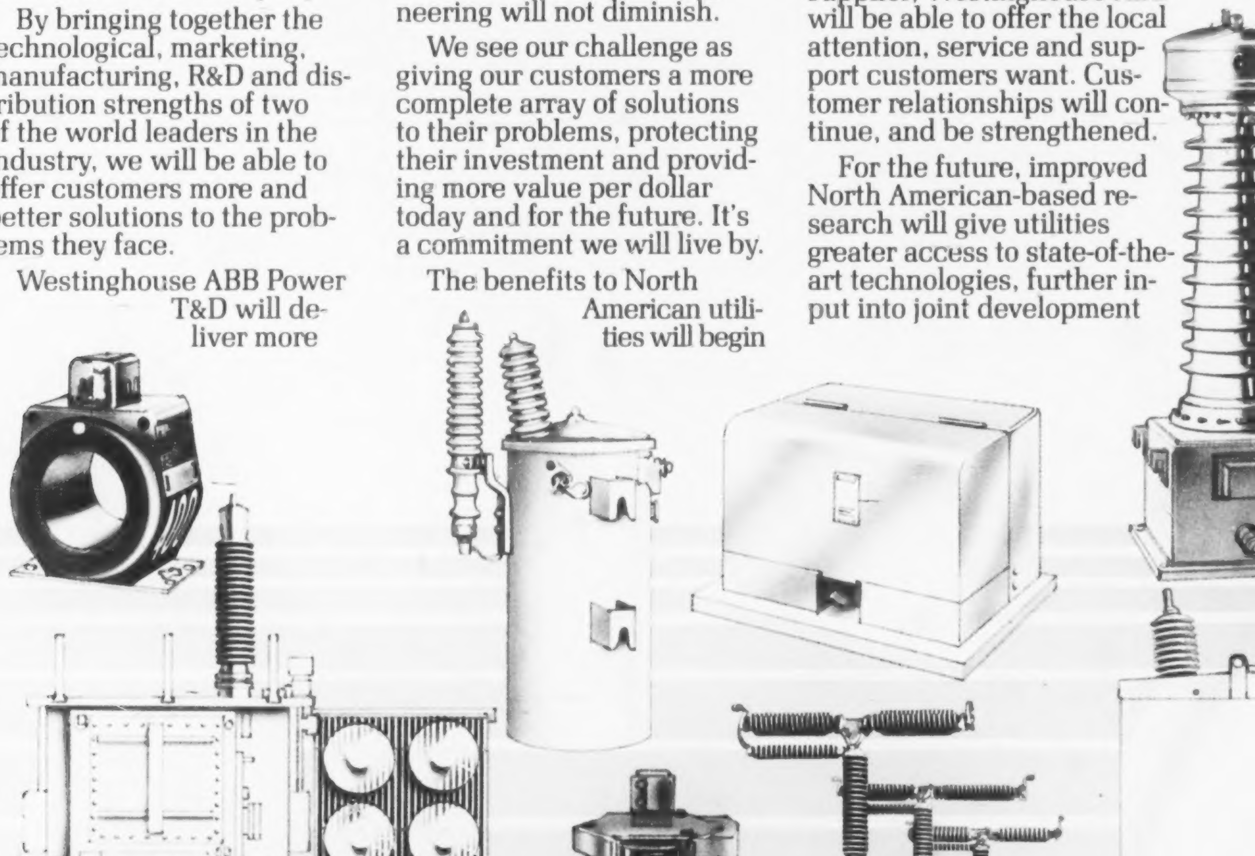

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of new technologies along with EPRI, and will supplement and reinforce ABB's worldwide R&D efforts.

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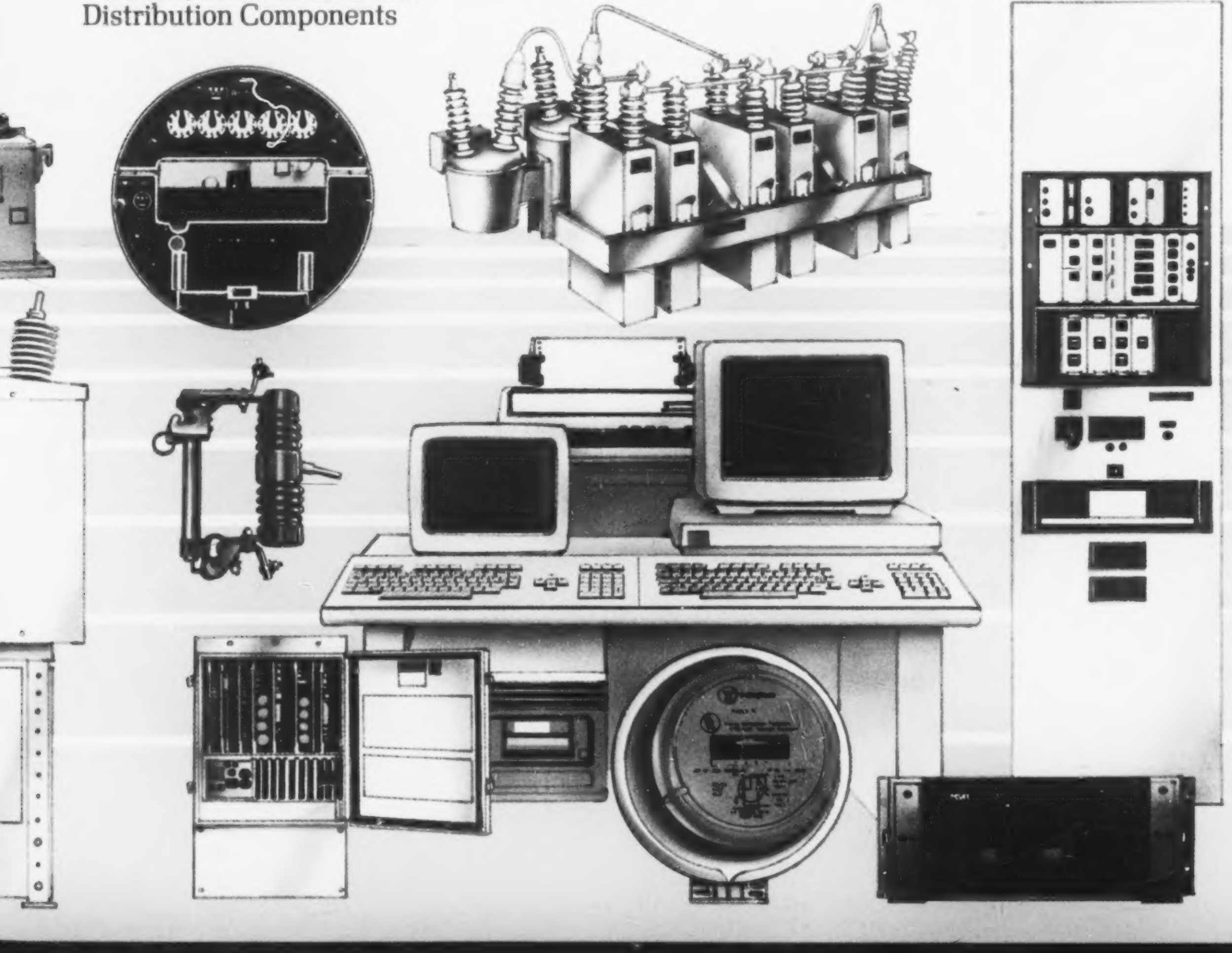
Included in the transaction are the Westinghouse Transmission and Distribution Operations, headquartered in Greentree, Pennsylvania. The divisions included are the Power Equipment Division, Distribution Transformer Division, Measurements and Control Division, Transmission and Distribution Components Division, Relay & Telecommunications Division and Small Power Transformer Division.

The three ABB operations included in the venture are the HV Equipment Division, the Relay Division and the Load Management Division. The operations of both partners are comprised of over 20 manufacturing locations and 67 sales offices employing almost 8,000 people. They generated combined sales of over $1.0 billion in 1988.

Heading the joint venture will be Joseph Baker, formerly the Westinghouse Vice President in charge of their Transmission and Distribution Operations.

Both participants bring to the joint venture long traditions of innovation and leadership. This partnership will offer utility customers the widest range of technological solutions to their needs available anywhere. The result will be a new company that offers enhanced technical strengths, and a deepened commitment to product and customer service leadership.



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Reactors
Oil Instrument Transformers
Bushings
Low-Voltage Instrument Transformers
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Transformer Components
Integrated Logistic Support Services for power transformers and power circuit breakers

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FINANCIAL REVIEW

TYPICAL UTILITY STOCKHOLDER PROFILED

The average electric utility common stockholder is a retired professional with an annual household income of $20 to $50 thousand. More likely a woman than a man, the typical stockholder has held between 100 and 500 shares of common for more than 5 years. (See Table 1.)

The profile is based on analysis of 13 company shareholder surveys received by Edison Electric Institute's Finance Division, plus survey results received from the American Society of Utility Investors. The surveys used in the analysis encompass a range of dates spanning 1981 to 1988. Although there were considerable differences in the manner in which companies categorized the demographic characteristics, statistics, when aggregated and averaged, suggest some notable demographic characteristics.

On the basis of a sample of 11 of the 14 surveys, an average of 65 percent of the shareholders were retirees. The statistics show that over half of the shareholders (60 percent) were over 65 years of age. The average of the aggregate also seemed to indicate that about 30 percent of the shareholders were between the ages of 45 and 65 years, while shareholders younger than 45 made up the balance, 10 percent.

The predominant occupation indicated by the employed shareholders was one of a professional or managerial nature. Those individuals who responded to these surveys as "professional" and "managerial" represented about one third of the aggregate sample.

On the average, approximately 48 percent of the shareholders owned between 100 to 499 shares of common stock. About 31 percent of the shareholders owned fewer than 100 shares of stock. On

Table 1
Demographic Profile of an Electric Utility Shareholder

	1989 Industry Average of Shareholder Surveys*	New York Stock Exchange's 1983 Survey of Shareholders
Number of company surveys received:	14	[4,549 individuals]
Age:		
Median:	65	46
Less than 45:	9%	48%
Between 45 & 65:	30%	34%
More than 65:	60%	18%
Employment status:		
Retired:	65%	17%
Employed:	29%	68%
Other:	9%	15%
Income:		
Median:	$39,400	$33,200
Less than $20K:	16%	22%
Between $20K & $50K:	48%	57%
More than $50K:	36%	21%
Gender:		
Male:	29%	48%
Female:	35%	52%
Joint Accounts:	28%	N/A
Percentage of stockholders who reinvest dividends:	34%	N/A
Marital Status:		
Married:	70%	71%
Single:	14%	14%
Divorced/Widowed:	15%	15%
Length of Ownership:		
Less than 1 year:	12%	N/A
Between 1 & 5 years:	32%	N/A
More than 5 years:	62%	N/A
Percentage holding for dividend income:	63%	N/A
Shares Held:		
1-100:	31%	N/A
100-500:	48%	N/A
500+:	21%	N/A
Education:		
High school or less:	30%	28%
Some college:	21%	26%
College or post graduate:	42%	37%

Notes: N/A indicates that comparable data were not available.
* indicates that averages were developed independently and may not equal 100 percent when summarized by category.

average, about half of all shareholders held between 100–500 shares for more than five years. Their primary reason for holding was income.

Fewer than one fifth (16 percent) of the shareholders had an annual household income of $20,000 or less, while approximately two out of three households (64 percent) earned less than $50,000. The median range of household income was in the area of $39,400.

Of the nine sample surveys that reported a distribution of shareholders by gender, or joint ownership and gender, the bias leaned toward women as being the majority of the shareholders—even though one company reported 56 percent male ownership. Joint ownership, when indicated, was a little less than one third of shareholders. Married shareholders represented over two thirds of all stockholders, while divorced/widowed and single were reflected almost equally in the balance.

Approximately 63 percent of shareholders attended at least one year of college, with roughly two out of three completing either college or post graduate work. Around 30 percent of shareholders had a high school education or less.

According to the New York Stock Exchange (NYSE) 1983 survey of shareholders in general, the median age of shareholders was 46.1 years. Retirees represented only 17 percent of all stockholders. The average shareholder was a married female who had some degree of formal college training. The median household income of the NYSE shareholder was $33,200 while the average household income for wage earners in the United States was $27,500.

FOURTH QUARTER EARNINGS DECLINE

Investor-owned electric utility earnings per share (EPS), before extraordinary items and the cumulative effect of an accounting change, decreased 10.0 percent from $2.60 in 1987, to $2.34 in 1988, despite a 5.4 percent utility operating income increase. Regulatory disallowances and their associated accounting writeoffs, along with a lower allowance for funds used during construction (AFUDC), caused the earnings decrease.

Total electric operating revenue increased from $129.4 billion in 1987 to $135.3 billion in 1988, a 4.6 percent increase reflecting the strong electricity sales growth in 1988. Leading to the sales increase were the continued expansion of the U.S. economy, first and third quarter weather conditions which produced record peak electricity demand for much of the country, and a decrease in the average real price of electricity.

The yearly operating electric revenue increase was offset by a 4.4 percent increase in electric operating expenses, which increased from $102.1 billion recorded in 1987 to $106.6 billion in 1988. The operating expense increase was primarily due to the increase of other operation and maintenance and depreciation expenses. Other operation and maintenance and depreciation expenses increased a combined 11.0 percent in 1988 over 1987. The increase of the two expense items was due to the placement of six baseload nuclear generating facilities into commercial operation during 1988. These new units increased O&M expenses due to the initial startup expenses incurred.

The electric operating revenue increase of 4.6 percent coupled with a 4.4 percent increase in electric operating expenses resulted in an increase of 5.1 percent in electric operating income. A successful year for combination companies' gas utility operations was evidenced by a 11.6 percent increase in other utility operating income from $1.12 billion in 1987 to $1.25 billion in 1988. The combination of the increase in electric operating income and other utility operating income led to a 5.4 percent increase in 1988 over the prior year's total for other utility operating income.

Annual and quarterly results for the industry's 1987 and 1988 income statement show the impact of regulatory and accounting treatment of recently completed plants. During 1987, after tax writeoffs totaled $2.64 billion, while in 1988, this amount totaled $3.74 billion. Most writeoffs contained in the income statement are related to disallowances and abandonments.

Other income & deductions decreased from a gain of $563 million in 1987 to a loss of $460 million in 1988. The significant $1,023 million decrease was due, for the most part, to the writeoffs mentioned above.

AFUDC dropped 38.8 percent from $4,905 million in 1987 to $3,001 million in 1988. Contributing to the decline were the completion of plants and lower levels of ongoing plant construction and the nonrecognition of deferred capital costs during the period between plant completion and a final rate case. The drop in AFUDC resulted in the improvement of the quality of earnings for the industry. AFUDC as a percentage of net income available for common declined from 32.3 percent in 1987 to 21.9 percent for 1988.

The pretax interest coverage ratio for 1988, excluding AFUDC, was 2.43 times, representing a 6.9 percent decrease from the 2.61 times of a year ago. This 1988 ratio is the lowest the ratio has been since 1982. The decline reflects the lower tax rate of the Tax Reform Act of

Table 2

Investor-Owned Electric Utility Industry Statement of Income

(Millions of Dollars)

	Three Months Ending December 31,			Twelve Months Ending December 31,		
	1988	1987r	% Change[3]	1988	1987r	% Change[3]
Total Electric Operating Revenues[1]	$32,191	$30,643	5.1	$135,279	$129,362	4.6
Electric Operating Expenses						
Fuel	$ 7,694	$ 7,308	5.3	$ 31,904	$ 31,214	2.2
Other Operation & Maintenance	11,720	10,543	11.2	42,756	38,467	11.1
Depreciation & Amortization	3,562	3,349	6.4	14,117	12,765	10.6
Costs Deferred Under Rate Phase-In Plans	(247)	(275)	(10.3)	(1,086)	(1,123)	(3.2)
Taxes Other Than Income Taxes	2,535	2,466	2.8	10,550	9,962	5.9
Income Taxes: Federal & Other	937	784	19.5	6,205	6,653	(6.7)
Deferred Income Taxes	324	609	(46.8)	2,482	3,674	(32.5)
Investment Tax Credits, Net	(204)	57	N.M.	(292)	493	N.M.
Total Electric Operating Expenses	$26,321	$24,841	6.0	$106,635	$102,107	4.4
Electric Operating Income	$ 5,870	$ 5,801	1.2	$ 28,644	$ 27,255	5.1
Other Utility Operating Income	355	256	39.1	1,246	1,116	11.6
Total Utility Operating Income	$ 6,225	$ 6,057	2.8	$ 29,890	$ 28,372	5.4
Other Income & Deductions—Net	(1,384)	(287)	(382.5)	(460)	563	N.M.
Phase-in Deferrals	260	342	(23.8)	963	948	1.6
Allowance for Other Funds Used During Construction	383	517	(25.9)	1,556	2,948	(47.2)
Total Income Before Interest Charges	$ 5,485	$ 6,629	(17.3)	$ 31,949	$ 32,831	(2.7)
Interest Charges						
Interest on Long-Term Debt	$ 3,756	$ 3,697	1.6	$ 14,859	$ 14,786	0.5
Other Interest Expenses & Charges	305	115	165.3	1,106	829	33.5
Allowance for Borrowed Funds Used During Construction	(344)	(407)	(15.7)	(1,445)	(1,958)	(26.2)
Net Interest Expenses & Charges	$ 3,718	$ 3,405	9.2	$ 14,520	$ 13,657	6.3
Net Income Before Extraordinary Items	$ 1,767	$ 3,224	(45.2)	$ 17,429	$ 19,174	(9.1)
Extraordinary Items	0	0	N.M.	(66)	(45)	N.M.
Cumulative Effect of a change in accounting principle	0	(399)	N.M.	(1,455)	(1,476)	N.M.
Net Income	$ 1,767	$ 2,825	(37.5)	$ 15,908	$ 17,653	(9.9)
Preferred Dividends Declared	536	571	(6.2)	2,198	2,450	(10.3)
Net Income Available for Common	$ 1,231	$ 2,254	(45.4)	$ 13,710	$ 15,203	(9.8)
Common Dividends Declared	3,185	3,029	5.1	12,904	12,688	1.7
Additions to Retained Earnings	($1,954)	($775)	(152.1)	$ 806	$ 2,514	(67.9)
Average Shares Outstanding (Millions)[2]	6,545	6,467	1.2	6,509	6,434	1.2
Earnings Per Share Before Extraordinary Items and the Cumulative Effect of a change in accounting principle[2]	$ 0.19	$ 0.41	(53.7)	$ 2.34	$ 2.60	(10.0)
Earnings Per Share After Extraordinary Items and the Cumulative Effect of a change in accounting principle[2]	$ 0.19	$ 0.35	(45.7)	$ 2.11	$ 2.36	(10.6)
Common Dividends Per Share[2]	$ 0.49	$ 0.47	4.3	$ 1.98	$ 1.97	0.5

SOURCE: EEI Survey Data and Standard and Poors Compustat II Database Service

[1] Revenues are adjusted for intra-industry sales for resale of electricity.

[2] Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.

[3] Percent changes may reflect roundings.

r—Revised to reflect company restatements.

N.M.—Not Meaningful.

Table 3

Investor-Owned Electric Utility Industry Balance Sheet

(Millions of Dollars)

Assets	Dec. 31, 1988	Dec. 31, 1987r	Percent Change[3]
Utility Plant[1]			
Utility Plant (Including Nuclear Fuel)	$461,613	$431,995	6.9
Less Accumulated Depreciation	130,738	117,892	10.9
Total	$330,875	$314,102	5.3
Construction Work in Progress	40,379	52,268	(22.7)
Net Utility Plant	$371,254	$366,370	1.3
Investments	19,612	15,788	24.2
Current Assets	42,589	42,589	(0.0)
Deferred Debits	30,985	28,065	10.4
Total Assets	$464,440	$452,812	2.6
Capitalization & Liabilities			
Capitalization			
Common Stock	$ 92,623	$ 90,558	2.3
Retained Earnings	52,446	51,828	1.2
Preferred Stock	26,596	26,896	(1.1)
Long-Term Debt	165,119	160,976	2.6
Total Capitalization	$336,784	$330,258	2.0
Current Liabilities			
Short-Term Debt	$ 7,585	$ 8,969	(15.4)
Long-Term Debt Due Currently	5,794	5,251	10.3
Other Current Liabilities	31,779	31,778	0.0
Total Current Liabilities	$ 45,118	$ 45,999	(1.9)
Deferred Credits			
Capital Lease Obligations, Non Current Portion	$ 4,932	$ 5,014	(1.6)
Accumulated Deferred Income Taxes[2]	46,779	43,308	8.0
Accumulated Deferred Investment Tax Credits	16,590	16,939	(2.1)
Other Deferred Credits	14,196	11,295	25.7
Total Deferred Credits	$ 82,538	$ 76,556	7.8
Total Capitalization & Liabilities	$464,440	$452,812	2.6

SOURCE: EEI Survey Data and Standard and Poors Compustat II Database Service

[1] Includes non-electric utility plant

[2] Includes property related deferred income taxes

[3] Percent changes may reflect roundings

r—revised

1986 and the effect writeoffs have had on earnings.

The declining trend of the electric utility industry's earned return on average common equity (ROE) continued in 1988 as earned ROE decreased to 10.6 percent from 11.7 percent in 1987. The change in ROE reflects the increase in average common equity, the downward trend in allowed returns authorized by commissions, and lowered income levels due to writeoffs. Exclusion of 1988 writeoffs would increase earned return on common equity approximately 160 basis points, from 10.6 percent to 12.2 percent.

The industry's balance sheet improved as six nuclear generating plants were completed and transferred to utility plant. Construction work in progress (CWIP) decreased from $52.3 billion as of December 31, 1987, to $40.4 billion as of December 31, 1988, a 22.7 percent drop. CWIP as a percentage of net plant in service dropped from 16.6 percent to 12.2 percent during the same period of time. Total utility plant increased 6.9 percent to $461.6 billion for the year ending December 31, 1988, compared to $432.0 billion recorded on December 31, 1987. Associated with the upward trend in utility plant was a 10.9 percent rise in accumulated depreciation from $117.9 at December 31, 1987, to $130.7 billion on December 31, 1988.

Investments for the industry increased 24.2 percent to $19.6 billion, up from the $15.8 billion recorded December 31, 1987. The increase was caused by two factors. First, a change in our data collection procedure beginning in the first quarter of 1988 added more unregulated subsidiary operations of holding companies. Often, this data was not reported in the prior year. Second, many companies are adding non-utility subsidiary operations.

Total capitalization for the industry increased from $330.3 billion at December 31, 1987, to $336.8 billion at December 31, 1988, a 2.0 percent increase. The main contributors to the increase were common equity, which increased 2.3 percent, and long-term debt, which increased 2.6 percent. The growth of the common equity component of total common equity was partially offset by many companies engaging in common stock buyback programs.

The embedded cost of long-term debt for the twelve months ending December 31, 1988, was 9.1 percent, down from the 9.2 percent recorded for 1987. On an annual basis, this is the lowest this ratio has been since 1980. The ratio remained low despite rising interest rates and the 2.6 percent increase in long-term debt mentioned above.

Note that the EPS percentage decrease is greater than the EPS percentage declines reported by others. EEI's methodology is to include in EPS figures the effects of nonrecurring items such as accounting changes and asset writeoffs. While these procedures reflect the true financial condition of the industry as reported, they somewhat mask the earnings capability of the industry from continuing operations.

Tables 2 and 3 are based on unaudited reports submitted by a sample of investor-owned electric utilities. The sample represents approximately 94.5 percent of the investor-owned electric utility industry's total assets and 97.5 percent of its electric utility revenues. The sample data is then adjusted to represent the entire investor-owned electric utility industry by using the Standard & Poor's Utility Compustat II database. ■

Contributed by Edison Electric Institute's Finance Division.

TECHNOLOGY REVIEW

U.S. LEADS WORLD IN NUMBER OF OPERATING SCRUBBERS

The United States operates more power plant stack gas "scrubbers" than any other country in the world, according to a new Edison Electric Institute survey.

According to the report, "Location of Power Plant Scrubbers in North America," the United States operates 149 scrubbers, up from 146 a year ago, representing 65,888 megawatts of generating capacity. Forty-two additional units are planned or under construction. Neither Canada nor Mexico has any scrubbers in operation or under construction. Stack gas scrubbers, also known as flue gas desulfurization systems, control sulfur dioxide (SO_2) emissions at coal-fired power plants.

From the peak year of 1973, up to 1987, total SO_2 emissions dropped 29.4 percent, according to the U.S. Environmental Protection Agency. Electric power plant SO_2 emissions were down 21.5 percent during the same period while utility coal use soared by 87.8 percent. In addition, the average sulfur content of coal used by utilities decreased approximately 37 percent.

"On a global scale, the United States continues to pursue its emission reductions goals, and our commitment has generated positive results," said John J. Kearney, EEI Senior Vice President, Energy and Environment. "The existing Clean Air Act is working, and the electric utility industry has been committed to meeting the guidelines on emissions as prescribed by the Act. In addition to operating 149 scrubbers, many utility companies use

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other methods to meet emissions standards, including the use of low-sulfur coal, coal washing, and coal blending," Kearney said.

Compliance with the Clean Air Act has been expensive. According to the Department of Commerce Bureau of Economic Analysis, the overall price tag for all air pollution control in the United States now exceeds $33 billion each year. Pollution controls account for more than one-third of a new coal-fired power plant's cost. A single scrubber may cost $100 million or more, and capital costs for adding scrubbers on older plants could equal or exceed the original plant investment.

"The electric utility industry continues its commitment to emission reductions by installing more scrubbers and by supporting the development of clean coal technologies," Kearney said. He explained that as these advanced technologies are further developed, "the promise of controlling both sulfur and nitrogen oxide emissions can be more easily achieved. They will provide a more efficient, effective way to control emissions without forcing the loss of countless jobs, disrupting the economy and increasing electricity costs associated with proposed acid rain legislation. Instead, these technologies will help our nation meet its future energy and environmental needs," he said.

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REGULATORY REVIEW

INTERIM REPORT ON WSPP EXPERIMENT ISSUED

According to independent consultants, the Western Systems Power Pool Experiment (WSPP) appears to have resulted in the benefits it was designed to provide: (1) increased availability of transmission and market information, (2) increased options for contracting, and (3) more trading partners. However, the consultants noted in their interim report that it was premature to reach any definitive conclusions ("Western Systems Power Pool Assessment: Interim Report," prepared by Strategic Decisions Group in conjunction with William Lindsay, January 1989).

To enable a more extensive analysis, Pacific Gas and Electric Company (PG&E) has filed, on behalf of the experiment's 24 participants, a request with the Federal Energy Regulatory Commission (FERC) for extension of the experiment, which is scheduled to end on May 1, 1989. Seeking permission to participate in WSPP, non-utility generators (NUGs) have intervened in PG&E's petition.

The consultants supported their conclusion by citing participants in the experiment who claimed to be "better off with the WSPP than . . . without it." In addition, the consultants noted that none of the participants have reported any detrimental effects attributable to the experiment.

Fifteen western utilities proposed the two-year experiment in 1986 to determine whether regional generation and transmission facilities can be used more efficiently in an environment of voluntary transmission access. In November 1986, PG&E, on behalf of the participants, requested that FERC waive rules and regulations that limit the pricing of economy energy, unit commitment, firm system capacity and/or energy sale or exchange transactions, and transmission services.

Under experimental rate schedules, the various types of bulk power transactions were priced subject to a ceiling rate based on the costs associated with the highest cost generation within the pool. Transmission service was priced similarly, subject to a floor of 1 mill

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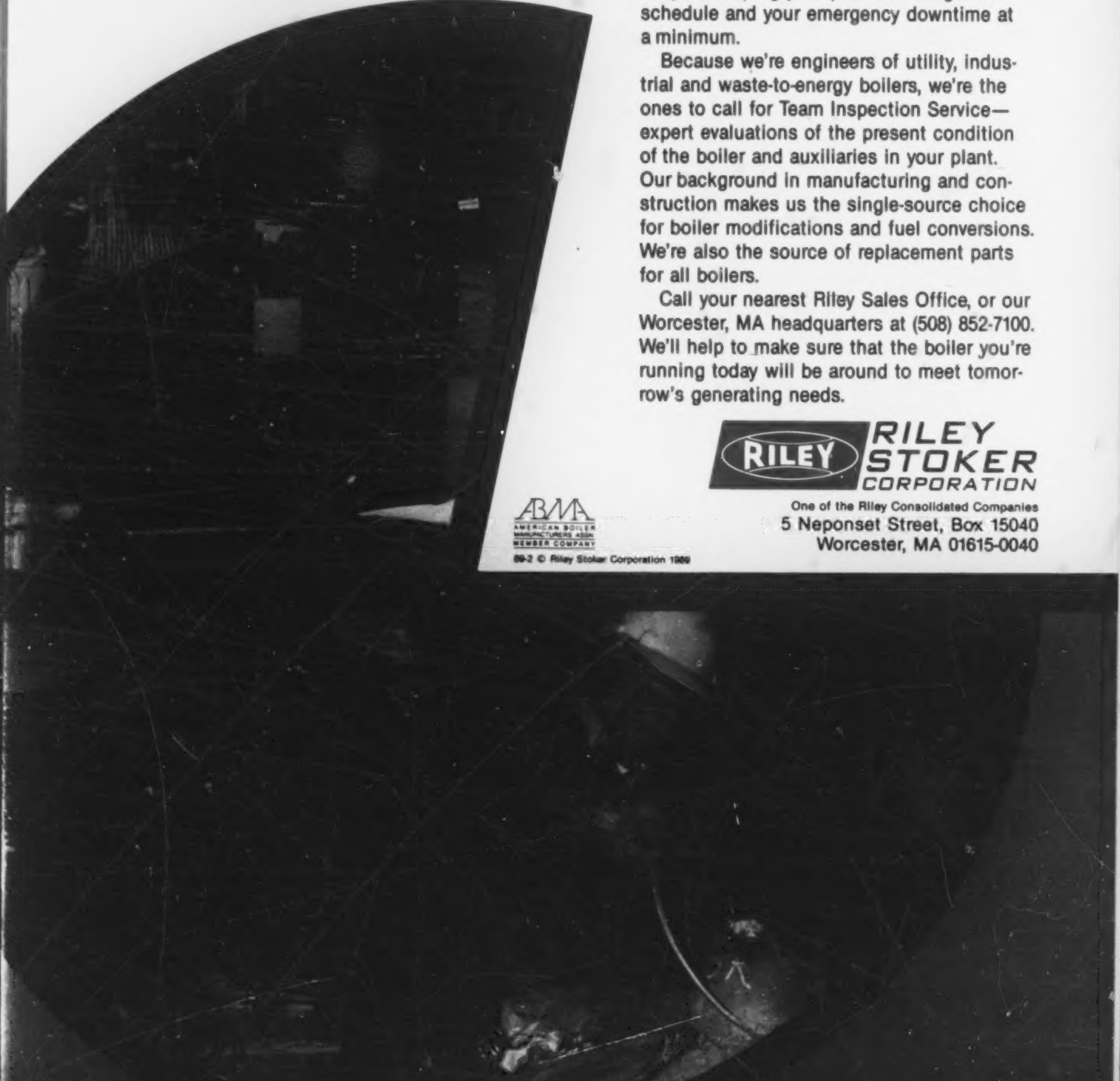

and a ceiling of 33 percent of the difference between the highest and lowest decremental cost of generation within the pool during the preceding year.

The Commission approved the experiment on March 12, 1987 (Pacific Gas & Electric Company, Docket No. ER87-97, Order Accepting Experimental Rates, March 12, 1987, 38 FERC 61,242), and the experiment started on May 1, 1987. With membership in the experiment open to any interconnected utility that operates a control area and owns generation, the number of participants has grown from the original 15 to 24. These participants included investor-owned, federal, municipal, and cooperative utilities in ten western states from Washington to Texas. Participants account for approximately 14 percent of the total generating capacity in the United States and more than 32 percent of the circuit miles of high-voltage (230 kV and above) transmission.

FERC's approval was conditioned on the retention of independent consultants to address whether the experiment produced the efficiencies envisioned and whether the pricing forumlae produced just and reasonable rates. The interim report therefore provided a detailed description of the methodology used to assess the effects of the WSPP on economic efficiency.

The methodology consisted of comprehensive evaluations of WSPP monthly transaction data, "Hub" clearinghouse data, and interviews. Since these mechanisms had not yet been fully implemented at the writing of the interim report, the consultants noted that it was premature to draw conclusions about economic efficiency and pricing. However, the consultants did observe that the "WSPP is actively used and that it appears to be resulting in the kinds of benefits it was designed to provide." A final report will provide a comprehensive analysis of the WSPP transactions through at least April 1989.

The participants' request for a two-year extension of the experiment was partly motivated by the desire to give the consultants more time to gather data (Motion for Extension of Experiment, Docket No. ER87-97-001, February 10, 1989). Under the proposed schedule, data for the final analysis would be collected through May 1, 1990, and a final report would be submitted to FERC by November 15, 1990.

Hadsen Electric, Inc., a non-utility marketer of electricity, intervened in the proceedings on February 27, 1989. It requested that FERC allow participation in WSPP to qualifying facilities (QFs) under the Public Utility Regulatory Policies Act (PURPA) of 1978 and to independent power producers (IPPs), which Hadsen defined "as entities owning or having entitlement to non-QF generating facilities, which do not have a franchised service territory or legislatively determined customer base, and which sell power from such facilities in wholesale transactions."

Hadsen claimed that, since NUGs are "similarly situated to WSPP participants with respect to the overriding purpose for which WSPP was formed and to their ability to meet pool obligations," the exclusion of NUGs from WSPP would be discriminatory. Further, Hadsen attempted to discredit the notion that NUGs are not similarly situated because they are not traditional utilities, citing the view that WSPP is not a traditional power pool. Hadsen also noted that failure to allow NUG participation "will preclude the Commission from gathering data on how coordination and economic efficiency might be enhanced by NUG participation." Finally, Hadsen requested that the Commission affirm that NUGs will be allowed to participate in "any follow-on experiments or permanent pooling arrangements of this type" in the future.

Citizens Power and Light Corporation also intervened, joining Hadsen's arguments.

According to the current participants, the experiment's effectiveness would be undermined if FERC grants the intervenors' requests.

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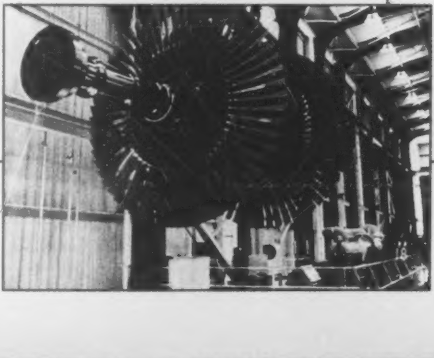

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Supplier Directory

In this special advertising section,
industry suppliers explain who they are and what they do.

Page

COMMUNICATIONS 62

COMPUTER SYSTEMS, SOFTWARE 62

FINANCE 64

FUEL MANAGEMENT 64

FUELS 64

LIGHTING EQUIPMENT, SYSTEMS 68

LINE PRODUCTS 68

MAINTENANCE PRODUCTS 68

MANAGEMENT CONSULTING / RESEARCH / TRAINING 70

MATERIALS MANAGEMENT 76

METERS / INSTRUMENTATION / TESTING 76

PERSONNEL / RECRUITMENT 76

PLANT DESIGN, ENGINEERING, CONSTRUCTION 76

PLANT EQUIPMENT, PARTS, SYSTEMS 82

SEMINARS / ASSOCIATIONS / PUBLICATIONS 86

TRANSMISSION / DISTRIBUTION SYSTEMS 86

T&D EQUIPMENT AND PRODUCTS, OTHER 87

TRAVEL / TRANSPORTATION 87

WASTE MANAGEMENT 87

SUPPLIER DIRECTORY

COMMUNICATIONS

CAMBRIDGE REPORTS, INC.
See Management Consulting/Research/Training

FLUOR DANIEL
See Plant Design, Engineering, Construction

COMPUTER SYSTEMS, SOFTWARE

ANDERSEN CONSULTING
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Established 1969

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Paul L. Alley (205) 772-1810
Thomas B. Headley (205) 772-1819

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Dallas, TX 75201

Phone (214) 754-2000
Established 1897

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Larry Lott
Dennis Bongers

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4411 East Jones Bridge Road
Norcross, GA 30092

Phone (404) 441-3387
Established 1971

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Brian Hajost
David Perme

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3174 Porter Drive,
Palo Alto, CA 94304

Phone (415) 354-8000
Established 1968

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Ernest G. Jerome, Marketing Engineer (415) 354-8164
Daniel N. Rowswell, Jr., Manager, Business Development (415) 354-8175

Specialization
SC activities include research, development, consulting, engineering, hardware/software design, system integration, project management, and the implementation of specialized, computer-based systems. SC's complex, large projects make extensive use of system engineering disciplines (control engineering, modeling and simulation, optimization and decision theory, operations research, data acquisition and processing, etc.) together with supporting disciplines in all branches of engineering and computer sciences.

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Phone (206) 453-4300
Established 1969

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J.H. Nordahl, V.P., U.S. Marketing (206) 453-4377
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Consol Plaza
1800 Washington Road
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Phone (412) 831-4000
Established 1864

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(412) 831-4370
J.W. Dailey, Vice President—Southeast & Midwest Sales
(412) 831-4402

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NERCO COAL CORP.

2043 Woodland Parkway
St. Louis, MO 63146

Phone (314) 993-2625
Established 1977

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Ronald N. Boesen, General Manager, Western Sales (303) 790-2002
George W. Rumsey, General Manager, Eastern Sales
(314) 872-2457

Specialization

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St. Louis, MO 63102
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Phone (314) 342-3400
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Specialization

Peabody Development Company (PDC) is a coal marketing and resource management organization responsible for all coal sales and related account services for Peabody Coal Company, Rochelle Coal Company, Powder River Coal Company and Eastern Associated Coal Corp.

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PITTSBURG & MIDWAY COAL MINING CO.
6400 S. Fiddler's Green Circle
Englewood, CO 80111
(A subsidiary of Chevron Corporation)

Phone (303) 930-4114
Established 1885

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Marketing (303) 930-4114
J.E. MacBride, Manager—Market
Development (303) 930-4057
M.H. Herzog, Sales Manager
(303) 930-4058

Specialization

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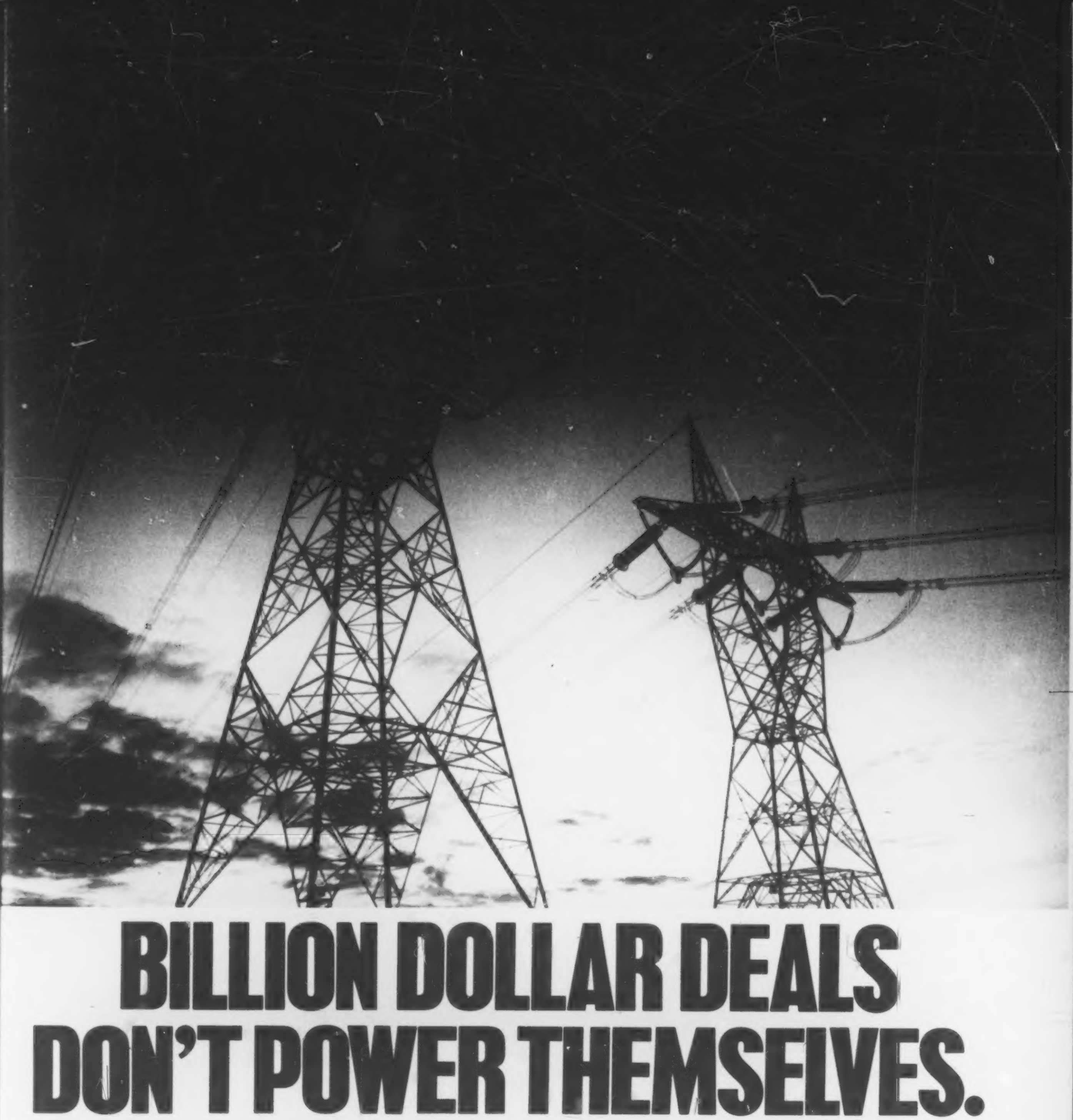
GE NUCLEAR ENERGY
175 Curtner Ave.
San Jose, CA 95125

Phone (408) 925-6623
Established 1878

Contacts
Northeast (Philadelphia Office)
(215) 962-6121
Southern (Atlanta Office)
(408) 662-7082
Central (Chicago Office)
(312) 573-3979

Specialization

GE Nuclear Energy specializes in supporting the positive performance of BWR-equipped generating stations worldwide. This support encompasses the supply of reload fuel and a broad array of services. Service offerings focus on areas where high technology, and GE's knowledge of how to apply it in the BWR environment, can reap the greatest benefits. Emphasis is on helping BWR owners lower O&M costs,



BILLION DOLLAR DEALS DON'T POWER THEMSELVES.

This year, Kidder, Peabody was advisor to Utah Power & Light in the biggest utility transaction in history, the $1.9 billion merger of Utah Power & Light into PacifiCorp.

Our role was to examine all the client's options and structure the transaction. It was an assignment that required creativity, discipline and an astute knowledge of the utility industry. Since 1986, large investor-owned utilities and small independent power producers have relied on Kidder, Peabody to complete transactions valued at $21 billion.

Whether you need financial advisory, or stock, bond or preferred underwriting, we're ready to help you take advantage of new opportunities. If you have a project that needs more energy and power, call our Utility Finance Group at 212-510-3633.

Kidder, Peabody

© KIDDER, PEABODY & CO. INCORPORATED 1989. FOUNDED 1865. MEMBER SIPC. OVER 60 OFFICES WORLDWIDE.

increase capacity factors, serve maintenance needs, improve safety, resolve regulatory issues and extend plant lifetimes.

Products/Services
In reload fuel, GE offers a choice of proven 8 × 8 matrix designs or an innovative 9 × 9 bundle. These fuel products are aimed at achieving longer operating cycles and higher burnup exposures while expanding fuel operating margins.

In service support, GE offers an array of leading-edge equipment retrofits. Consulting engineering and licensing services span all aspects of plant operations. Training, replacement parts, outage services plus electrical/mechanical equipment services round out GE's scope of BWR plant support.

Company Statement
GE is a leading international nuclear technology company. Among the 10 largest U.S. corporations with annual sales exceeding $50 billion, GE maintains a proud heritage as the world's foremost supplier of electrical equipment.

Three decades of experience in the fields of BWR systems, fuel and services, as well as advanced reactor design, have uniquely positioned GE to respond to nuclear industry needs. Coupled with GE's unmatched knowledge of the BWR, this experience reflects a unique GE/utility team effort.

UNISON TRANSFORMER SERVICES, INC.
See Waste Management

UNITED ENERGY SERVICES CORPORATION
See Plant Design, Engineering, Construction
See Management Consulting/Research/Training

WESTINGHOUSE ELECTRIC CORPORATION
See Plant Equipment, Parts, Systems

MANAGEMENT CONSULTING RESEARCH • TRAINING

ANDERSEN CONSULTING
World Headquarters
69 West Washington
Chicago, IL 60602

Phone (312) 580-0069

Contact
George Hill, Managing Partner
(602) 257-9234
Andersen Consulting's Utilities Industry Group
1 Renaissance Square
II North Central Suite 1000
Phoenix, AZ 85004

Specialization
Andersen Consulting's Utilities Industry Group—200 consultants worldwide—works with many of the major utilities to apply technology for competitive advantage. This includes GEO facilities management, customer information, work flow management and financial management systems. All are focused on helping utilities improve services, develop new products and deliver them quickly.

Products/Services
Customer/1. The Customer Information System Solution which focuses on helping utilities improve customer service while maintaining competitive rules.

Company Statement
Andersen Consulting, a division of Arthur Andersen & Co., works with companies to apply technology for competitive advantage. With more than $1.3 billion in revenues, the Firm offers a mix of industry, business and technology specific skills, plus the services necessary to integrate complex business systems. Andersen Consulting employs 15,000 extensively trained consultants worldwide.

BLACK & VEATCH, ENGINEERING-ARCHITECTS
See Plant Design, Engineering, Construction

CAMBRIDGE REPORTS, INC.
675 Massachusetts Avenue
Cambridge, MA 02139

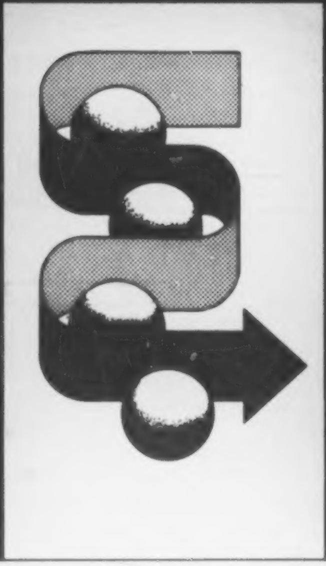
Phone (617) 661-0110
Established 1974

Contacts
Gene Pokorny, President
James V. Murphy, Executive Vice President

Specialization
Cambridge Reports has done over 700 consumer and market research and consulting projects for over 100 electric companies since 1974. From doing this research—in areas such as customer service delivery, marketing, demand-side management, communications, and planning and forecasting—we've learned that customer needs, attitudes, and behavior are constantly changing. Well-designed customer research and analysis is the only route to understanding these changes, meeting the challenges they present, and ultimately profiting from them.

Products/Services
Cambridge Reports offers clients a full range of consumer and market research services for custom-designed projects. Services range from comprehensive studies ("full service") to collecting data or drawing samples ("field and tab") for clients who design their own questionnaires. In all its research and consulting, Cambridge Reports provides clients with its value-added perspective and interpretation of exactly what the research data means and how it can be made actionable.

Company Statement
Cambridge Reports provides both private and public decisionmakers with superior consumer and market research and business information. Since 1974 Cambridge Reports has concentrated on serving the research needs of the electric utility industry. By providing accurate, innovative, and cost-effective



Celebrating 50 years of pioneering ion exchange resin technology.

ROHM AND HAAS

MEYER INDUSTRIES

Over two decades of leadership as designers and manufacturers of steel structures for the electric utility industry.

☐ **Tubular Steel Structures** offers transmission design engineers maximum versatility in meeting the demands of right-of-way, loading conditions and budget restraints. Single or multi-leg structures 69kV to 765kV.

☐ **Light Duty Steel Poles** are an engineering alternative to wood poles. Standard LD steel poles are available in ten classes in heights from 60-110 feet with a natural weathering steel finish.

☐ **Steel Davit Arms** for LD steel, concrete or wood poles. Light, medium and heavy classes for 34kV-230kV. Available in weathering steel, painted or galvanized finishes.

☐ **Steel Components** include crossarms and crossbraces for wood H-frames from 69kV to 345kV.

☐ **LD H-Frames** are an alternative to conventional wood H-frames. Single piece legs, spar arms and cross braces result in five components easily assembled and erected.

☐ **Lattice Tower Structures** designed, detailed and fabricated to exacting requirements. A library of existing designs as a resource to meet design criteria.

Three fabricating facilities to meet the needs of the electric utility industry:

- Hager City, Wisconsin
- Anniston, Alabama
- Houston, Texas

FL INDUSTRIES, INC.
MEYER INDUSTRIES DIVISION
P.O. Box 114, Red Wing, MN 55066
(715) 792-2811

research data, interpretation and consulting, Cambridge Reports helps its clients become more knowledgeable about and responsive to consumer and market needs, expectations and behavior in order to improve their operating and financial performance.

CRESAP MANAGEMENT CONSULTANTS, A TOWERS PERRIN COMPANY

200 West Madison Street
Chicago, IL 60606

Phone (312) 263-7125
Established 1946

Contacts

Leonard R. Wass (312) 263-7125
Bruce R. Pittenger (213) 556-0330
Fran J. Andrews (212) 953-7000

Specialization

Cresap is a general management consulting firm which helps top management solve problems and capitalize on opportunities. For over 40 years, Cresap's Energy Services Practice has worked with many of the top electric, gas, and combination utilities around the world, helping them strategically respond to business and regulatory changes.

Products/Services

With services such as Productivity Enhancement, Rightsizing and Restructuring, Market and Competitive Analysis, Strategy Development, Management Audits, Acquisition and Unbundling Analysis, and Nuclear Management Effectiveness, Cresap regularly helps its utility clients gain the wherewithal to be major players in their competitive markets.

Company Statement

Cresap views its role as that of an "agent of change." We endeavor to develop imaginative yet practical programs and recommendations that can be carried out within the limits of available resources. Our success is ultimately measured by the change that occurs as a result of our work—changes in strategy, organization, human resources, competitive position, financial results, or communication methods.

ENERGY MANAGEMENT ASSOCIATES, INC.

3715 Northside Parkway
Atlanta, GA 30327

Phone (404) 261-5256
Established 1975

Contact

John A. Higley (404) 261-5256

Specialization

EMA provides utilities with software to help executives and managers tackle the complex issues of finance, strategic planning, regulation and operations. Our software systems are used daily in over 100 utilities. When you buy software you are buying the people behind it. We complement our software with consulting services that provide direction and analytical support to utility managers. And we provide expert testimony in rate proceedings, certification cases, special commission investigations and litigation.

Product/Services

- ▶ PROMOD III® Electric utility production costing and fuel budgeting.
- ▶ PROSCREEN II® Integrated resource and corporate planning.
- ▶ PROVIEW™ Optimal resource planning.
- ▶ MAINPLAN® Operations and maintenance planning, unit commitment and transaction analysis.
- ▶ SENDOUT™ Distribution and supply planning for natural gas utilities.
- ▶ ACUMEN™ Financial planning system for forecasts, budgets and regulatory filings.
- ▶ ACUFILE™ Complete tax filing system.
- ▶ STRATAGEM® Fourth generation decision support software.
- ▶ CONSULTING Economic and management consulting on financial planning, regulatory, operations and emerging strategic issues.

Company Statement

When it absolutely has to be right when regulatory credibility is at stake you need EMA. Since 1975, EMA has led the industry in developing and supporting software systems that provide utilities the information they need to better manage their business.

GILBERT/COMMONWEALTH

See Plant Design, Engineering, Construction

KPMG PEAT MARWICK

1601 Elm Street, Suite 1400
Dallas, TX 75201

Phone (214) 754-2000
Established 1897

Contacts

Larry H. Lott
Dennis Bongers
Richard Treich

Specialization

KPMG Peat Marwick specializes in providing experienced regulatory consulting to utilities facing difficult regulatory issues and requirements. We begin with a hands-on review of the client's specific problems and develop tailored and unique business solutions to resolve the issues. The results are typically proven and reliable methods which will enable successful resolution of the regulatory issue.

Products/Services

KPMG Peat Marwick provides varied management consulting services to the Utility industry. Included in those services are expertise in dealing with regulatory matters as well as providing litigation support. Specifically these services include expert testimony and analysis of current rate structures, revenue requirements, FASB pronouncements, working capital and cost of service issues. We provide these services to utilities and/or their legal advisors. We also provide diagnostic reviews of utility operations to enhance productivity, effectiveness and efficiency.

Company Statement

KPMG Peat Marwick is the world's largest public accounting and consulting firm. We operate in over 650 offices in 115 countries, and employ over 43,150 professional personnel. A primary reason for the success of our Firm is our commitment to provide spe-

"If you don't fly pretty soon, I'm sending for a UESC team!"

Being the best means having the technical abilities and unmatched experience level to pinpoint the problem. That is why our clients do not hesitate to call in UESC when they need problems detected and evaluated quickly and accurately. UESC professionals leave their mark of distinction wherever they go – an air of confidence that comes from being enthusiastic and knowledgeable.

UESC professionals pride themselves on their ability to serve clients with quality, commitment and reliability. Being there when our clients need us is the policy that has earned UESC the reputation in the nuclear industry as cost-effective, results-oriented and consistent performers.

As an operations services organization, we work to maintain a high level of quality in our solutions, service and people. Put the talent of the proud and professional team of UESC to work for you.

UESC: Quality and Reliability
When You Need it Most

United Energy
Services Corporation

UESC is a wholly-owned subsidiary
company of Gilbert Associates, Inc.
Equal Opportunity Employer M/F

1640 Powers Ferry Road
Building 11
Dept-EEI
Marietta, GA 30067
404/951-8989

525 Lancaster Avenue
P.O Box 1616
Dept-EEI
Reading, PA 19603
217/375-0051

7585 East Redfield Road
Suite 209
Dept-EEI
Scottsdale, AZ 85260
602/951-1191

cialized professional services and expertise by industry. Of the 25 industry specialties within KPMG Peat Marwick, electric utilities (including customer systems) is one of our most active practices.

KPMG PEAT MARWICK

See Computer Systems, Software

MANAGEMENT ANALYSIS COMPANY

12671 High Bluff Drive
San Diego, CA 92130

Phone (619) 481-3100
Established 1975

Contacts

John E. Ward, President and Chief Executive Officer
John P. Jackson, Vice Chairman
Robert C. Traylor, Vice Chairman

Specialization

MAC is a widely respected leader among management consulting firms serving electric utilities and related industries in the power generation field. We have completed assignments for approximately 85 percent of the major utilities in the U.S. MAC senior consultants frequently serve as utility executives and managers. A number of our senior consultants also hold prominent positions within the industry's technical and trade associations and are frequently invited as industry experts to address conferences and utility meetings.

Products/Services

MAC and its subsidiaries provide a broad range of management and technical consulting services to the utility and energy industries and government. Services include corporate management consulting, project and program management, plant operations, quality assurance, human and organization effectiveness, regulatory and litigation support, engineering management, fuel management, information systems, telecommunications, and training. MAC's objectives are to enhance client profitability, improve performance, and assist in assuring and demonstrating prudent management of client organizations.

Company Statement

MAC was founded in 1975 to provide management and consulting services to electric utilities. Today, a staff of over 350 offers a wide spectrum of services to utility, energy, and selected industries. Our staff reflects the highest senior technical and managerial expertise within those industries. Our consultants form integrated, multi-disciplined teams to meet specific client needs and to help clients develop strategies for the future. We help organizations perform effectively in today's dynamic business environment.

ORGANIZATIONAL ANALYSIS CORPORATION

15915 Katy Freeway, Suite 385
Houston, TX 77094

Phone (713) 578-6906
Established 1985

Contacts

Jan Griebe
Roger Griebe

Specialization

Organizational Analysis Corporation provides professional management consulting services to the utility industry through hands-on involvement with management and staff and through the development of integrated management systems within the organization. Activities include optimization of organizational performance through modification of work processes, functional structure, staffing levels, culture, and administrative processes. Cost effectiveness and organizational efficiency are two of the management performance parameters utilized for measuring and developing organizational performance.

Products/Services

The company bases its approach to addressing management issues on its "Managing Change" process, a pragmatic methodology that has proven in actual use to be extraordinarily useful in gathering, assessing, interpreting, and diagnosing organizational issues at management as well as operational levels. Other management aids developed for the utility industry include Plant Enhancement Team (PET) Projects for team building and problems resolution, and Management Accountability Program (MAP) for strengthening control and direction of the organization.

Company Statement

Organizational Analysis Corporation believes that integrated management systems are important for the success of the utility industry in today's tight regulatory and competitive commercial environments. "Managing Change" allows the organization to assess and respond to these external environmental forces through the sequence of assessment, enhancement, and innovation in a progressive strengthening process for the organization. Successful utilities in the future will be those that were able to correctly manage change and respond to the new environments to their best interests.

STOCKHOLDER SYSTEMS, INC. (SSI)

See Computer Systems, Software

UNITED ENERGY SERVICES CORPORATION

1640 Powers Ferry Road, Building 11
Marietta, GA 30067

Phone (404) 951-8989
Established 1981

Contacts

G. Carl Andognini, Sr. Vice President, Scottsdale, AZ (602) 951-1191
James P. O'Hanlon, Vice President, Marietta, GA (404) 951-8989
Fred W. Symons, Vice President, Reading, PA (215) 375-0051

Specialization

United Energy Services Corporation is a professional engineering, management and technical services organization, specializing in operations support to the energy industries, and particularly to nuclear and fossil electric utility companies. Attention is focused on establishing the requirements for each

Is this the year you take control?

If you're ready to bring shareholder services in-house, we're ready to help.

We're Stockholder Systems, Inc. (SSI), and for the past 18 years, we've provided the nation's utilities with the software they need to perform shareholder processing and recordkeeping in-house.

Our corporate customers have discovered that when they handle their own securities activity, they gain immediate access to their most important information, greater control over their operation and the means to better serve their shareholders.

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At SSI, we have the experience and expertise to help you offer this level of service. Already, 76% of the top 100 utilities* handling their own securities activity in-house, have turned to SSI for help.

Our family of securities systems allows your organization to process common and preferred stock, bond issues, dividend reinvestment and employee plans in-house.

And our complement of training, consulting and conversion services ensures that you get the most from your investment.

Call or write Mike Paulk, President, Securities Products Division, for more information. **And make this the year you take control.**

SSI

Stockholder Systems, Inc., 4411 East Jones Bridge Road, Norcross, Georgia 30092 (404) 441-3387

Source: Business Week "Top 1000" issue

task and the identification of the needs and desires of our clients, so that the services of individuals with just the right mix of talent and directly applicable experience can be provided. As always, there is strict adherence to the highest standards of business and professional ethics.

Products/Services
Qualified professionals with extensive nuclear and fossil plant operations, maintenance and technical field experience can successfully complete any project, from start-up to efficient operation. Experience and proven expertise include: Management Services; Cogeneration Support; Engineering and Technical Services; Operations Services; Maintenance Services; Training; Planning and Scheduling; Project Controls Services; Radiological Protection Services; Environmental and Radwaste Management Services; Computer Support Services; Configuration Management Services; Licensing and Regulatory Compliance Support; and Operational Assessments of all types.

Company Statement
United Energy Services Corporation was founded in 1981 as a private enterprise dedicated to providing the highest quality of professional operations services. Gilbert Associates, Inc. became aware of UESC's reputation of providing superior performance to electric utility clients through the use of carefully selected personnel with previous "hands-on" operating plant experience, and acquired UESC from its owners and founders in 1984. UESC continues to be held in the highest regard when complex problem solving reliability and timeliness are demanded.

UNITED ENGINEERS & CONSTRUCTORS
See Plant Design, Engineering, Construction

MATERIALS MANAGEMENT

UNITED ENERGY SERVICES CORPORATION
See Plant Design, Engineering, Construction
See Management Consulting/Research/Training

METERS • INSTRUMENTATION • TESTING

BAILEY CONTROLS, DIVISION OF BABCOCK & WILCOX
29801 Euclid Avenue
Wickliffe, OH 44092

Phone (216) 585-8500
Established 1916

Contacts
Roger S. Hull (216) 585-8498
Harold I. Sternberg (216) 585-6580
Phillip R. Lehtola (216) 585-8490

Specialization
Bailey Controls is a leading supplier of distributed digital control and data acquisition systems to the electric utility industry. This year, we are pleased to announce the introduction of Bailey INFI 90™ Strategic Process Management Systems, combining advanced control functionality, environmentally-hardened packaging, and direct compatibility with more than 8500 Bailey NETWORK 90 distributed process control systems worldwide.

Products/Services
Beyond distributed systems, Bailey provides a complete line of "smart" field instrumentation to measure, indicate and record process variables such as pressure, differential pressure, temperature, mass flow, vortex flow, pH, and conductivity. Supporting NETWORK 90 and INFI 90 systems is the Bailey Engineering Workstation which allows users to configure, document, and download advanced control strategies in simple "cut and paste" fashion without specialized programming knowledge.

Company Statement
Bailey has been a leading supplier to the utility industries for nearly 75 years. Our broad line of products and systems allows the user to integrate such diverse functions as burner management, boiler controls, ash handling, coal handling, scrubber controls, turbine controls, motor controls, data acquisition, and performance calculations on a single communications highway, for true plantwide process management performance.

DIAMOND POWER SPECIALTY COMPANY
See Plant Equipment, Parts, Systems

ENSR OPERATIONS
See Waste Management

GE INDUSTRY & UTILITY SALES
See Plant Equipment, Parts, Systems

UNITED ENERGY SERVICES CORPORATION
See Plant Design, Engineering, Construction
See Management Consulting/Research/Training

PERSONNEL • RECRUITMENT

MANAGEMENT ANALYSIS COMPANY
See Management Consulting/Research/Training

PLANT DESIGN, ENGINEERING, CONSTRUCTION

ASEA BABCOCK
One Park Centre/Suite 301
Wadsworth, OH 44281

Phone (216) 334-2504
Established 1987

Contacts
Charles J. Baroch, President
Alan D. Jensen, Mgr. Marketing & Sales

Specialization
Pressurized Fluidized Bed Combustion Systems (PFBC) for electric power gen-

eration. Design and build units for repowering existing plants. Plan and build new, totally integrated PFBC power plant systems.

Products/Services
ASEA Babcock has uniquely joined the environmental control and fuel flexibility benefits of fluidized bed combustion with a highly efficient gas turbine and steam generation combined cycle, to create a totally integrated, cost-effective system for power generation and pollution control.

Company Statement
The ASEA Babcock Commitment: We will continue to develop PFBC technology. We will continue to design and build units for repowering existing plants. And, we will plan and build new, totally integrated PFBC power plant systems.

We are confident that PFBC combined cycle power generation is the economic and environmentally compatible solution for clean electricity and heat production from coal.

BABCOCK & WILCOX—FOSSIL POWER DIVISION

20 S. Van Buren Ave.
Barberton, OH 44203

Phone (216) 753-4511
Established 1867

Contact
John Clough, Mgr., Market
Communications (216) 860-6728

Specialization
Designing and supplying boilers and related components and services has been the primary business of Babcock & Wilcox for over 120 years. From designing, manufacturing and erecting a complete boiler system to providing testing services and replacement parts, B&W has been a recognized leader in the advancement of steam generation technology.

Products/Services
The Fossil Power and Energy Services Divisions of Babcock & Wilcox produce steam generating systems and turnkey power plants for electric utilities, including boiler components such as coal pulverizers, environmental control and other auxiliary equipment. B&W also provides engineering services, retrofits and upgrades, condition assessment studies and complete boiler service, as well as a full line of quality replacement parts.

Company Statement
Fossil Power and Energy Services are Divisions of Babcock & Wilcox. Babcock & Wilcox is a major operating unit of McDermott, International, Inc., a leading energy services company. McDermott and its subsidiaries provide worldwide engineering and construction services for industrial and commercial facilities onshore and to the oil and gas industry offshore. The B&W unit manufactures steam-generating equipment, tubular products and process control systems.

BECHTEL POWER CORPORATION

Fifty Beale Street
P.O. Box 3965
San Francisco, CA 94119

Phone (415) 768-1234
Established 1972

Contacts
C. W. Hull, President (415) 768-5727
L. G. Hinkelman, Managing Director
(415) 768-0277
H. W. Wahl, Managing Director
(415) 768-3718

Specialization
Engineering and construction services to domestic and international utilities, governments, and private clients; including operating services for nuclear and fossil-fired plants. Full-service turnkey programs, including financial assistance and lump-sum contracting, economic and technical feasibility studies, licensing, project management, startup services, maintenance support and operations.

Products/Services
Design and construction of thermal power generating facilities. Operating, maintenance, and modification services for nuclear and fossil facilities. Alternate generation technology studies; fuel conversion studies; environmental assessments; project development, including structuring and financing; information services; quality assurance and control; procurement; and life extension/plant betterment analyses and plans.

Company Statement
Bechtel provides premier technical and management services to develop, manage, engineer, build, and operate installations and perform other related services to improve the standard of living and quality of life worldwide.

BECHTEL-KWU ALLIANCE

15740 Shady Grove Road
Gaithersburg, MD 20877-1454

Phone (301) 258-4600
Established 1987

Contacts
Hugo Pomrehn, Manager
(301) 258-4229
Diethelm Knoedler, Deputy Manager
(301) 258-3624
E. James Reinsch, Manager of
Marketing (301) 258-3571

Specialization
An Alliance providing selective operating services to the United States nuclear utilities.

Products/Services
Integrated outage services; outage planning and management, refueling services; including fuel and core component handling, refueling equipment, testing and repair. Equipment services; steam generator repairs and replacement, reactor coolant pump maintenance and repair, valve services including diagnostic, engineering and maintenance. Inspection and testing, mechanized or manual. Steam generator inspection, sludge lancing and chemical cleaning. Chemical decontamination, water chemistry and radwaste services.

Company Statement
The Bechtel-KWU team provides a broad range of specialized skills needed for responsive, cost effective service for operating nuclear power plants. Through advanced manage-

ment techniques, proven technology and innovative methods, the Bechtel-KWU team has the skills to improve plant performance and to significantly reduce schedules, radiation exposures and bottom line costs. These capabilities are supported by the full resources of the Bechtel and KWU organizations.

BLACK & VEATCH, ENGINEERS-ARCHITECTS

P.O. Box 8405
Kansas City, MO 64114

Phone (913) 339-2000
Established 1915

Contacts

P. J. Adam (913) 339-2098
R. G. Ruisch (913) 339-7268
B. J. Stables (913) 339-7261

Specialization

Complete engineering services for electric power generation, transmission and distribution, as well as plant betterment and related electric system requirements. These include studies, facilities design, construction management and support services such as water/wastewater consultation, rate studies, computer services, financial planning and management studies, procurement, and advanced technology.

Products/Services

Services are provided for the following project types: Electric Generating Plants; Waste-to-Energy Facilities; Hydroelectric Plants; Plant Modifications; Plant Life Extensions; Transmission and Distribution; Steam Generation; Petrochemical Facilities; Gas Systems; Solar Energy and Photovoltaics; Energy Management; and Fiber Optic Telecommunications.

Company Statement

Black & Veatch is a private partnership with more than 74 years of experience in handling electric power projects for clients throughout the world. One of the largest engineering-architectural firms in the U.S., it has performed nearly 15,500 projects for more than 3,500 clients and a significant percentage of these assignments have involved studies, design and construction management services for electric utilities. The firm's staff includes engineers representing every major discipline as well as architects, planners, scientists, financial experts, lawyers, skilled technicians and administrative personnel.

BROWN & ROOT U.S.A., INC.

4100 Clinton Drive
P.O. Box 3
Houston, TX 77001-0003

Phone (713) 676-3351
Established 1919

Contacts

R. R. Harl, Vice President
(713) 676-8092
P. J. Heinze, Vice President
(713) 676-4223
B. E. Lurie, Manager of Business Development (713) 676-3351

Specialization

Turnkey capability or any combination of the full range of services for domestic and international thermal power generation facilities in all current technologies, particularly, fluidized bed combustion, pulverized coal, combustion gas turbine, and combined cycle plants. Expertise includes high energy piping analysis, control system and other plant upgrades, and life extension. Brown & Root has provided over 43,000 MW of designed and/or installed electrical generating capacity.

Products/Services

Design and construction of thermal power generation facilities. Full services include project development; project management; planning; economic and technical feasibility studies; conceptual, preliminary, and detailed engineering and design; independent engineer project monitoring; full procurement capability including purchasing, expediting, and traffic; merit shop construction; startup, testing, and operations training; total maintenance responsibility as well as turnarounds and supplemental maintenance; project financing; QA/QC, NDE and vendor shop inspection.

Company Statement

Brown & Root, founded in Texas in 1919, has achieved a remarkable and diversified growth to become the premier merit shop construction company in volume. Brown & Root provides engineering, construction, and related services for electric utilities, chemical and petrochemical industries, refineries, pulp and paper industry, metals processing, manufacturing plants, and highways and bridges; maintenance services for industry and government. All services are provided both nationally and internationally.

CHAS. T. MAIN, INC.

101 Huntington Avenue
Boston, MA 02199

Phone (617) 262-3200
Established 1893

Contacts

S. B. Barnes, V.P. (617) 859-2500
R. E. Gaunt, Mgr. (818) 440-3681
B. Y. Afshar, Mgr., Business Development (617) 859-2060

Specialization

Engineering, Design, Procurement, Construction Management for Fossil Fueled and Hydroelectric Power Generation Facilities and for Substations and Transmission and Distribution Facilities.

Products/Services

- Feasibility Studies
- Load Forecasting
- Cost of Service Studies
- Engineering
- Detailed Design
- Licensing
- Environmental Studies
- Plant Life Extension
- Photogrammetry

Company Statement

Chas. T. Main, Inc., is a wholly-owned subsidiary of The Parsons Corporation, Pasadena, California. Headquartered in Boston, MAIN offers a full range of licensing, engineering, and construction management capabilities and services throughout the world.

SUPPLIER DIRECTORY

COMBUSTION ENGINEERING, FOSSIL SERVICES DIVISION

See Plant Equipment, Parts, Systems

EBASCO SERVICES INCORPORATED

Two World Trade Center
New York, NY 10048

Phone (212) 839-1444
Established 1905

Contacts

Larry E. Shaw, Vice President
(212) 839-2140
Don H. Lucas, Vice President
(404) 662-2077
Joseph A. Franco, Vice President
(714) 662-4092

Specialization

Ebasco is a full service engineering and construction company serving electric utilities, energy-intensive industries and government agencies worldwide. Since 1905, Ebasco has designed and constructed 25,000 miles of transmission lines, equalling the circumference of the earth.

Products/Services

Ebasco provides a wide range of specialty services to electric utilities including design, engineering, construction, construction management, complete startup, maintenance and retrofit programs, testimony in prudency review, outage planning, licensing, safety analysis report updating, configuration management, procurement specification, nuclear waste management and hazardous waste remediation.

Company Statement

Ebasco Services Incorporated, an ENSERCH engineering and construction company, provides engineering, consulting, environmental, construction, quality programs and advanced technology services to utility, industrial, and government clients worldwide. Dallas-based ENSERCH Corporation is a diversified energy, engineering and construction company.

FLUOR DANIEL

301 North Main Street
Greenville, SC 29601-2170

Phone (803) 298-3500
Established 1912

Contacts

Peter Van Nort (803) 298-3374
Mike Epprecht (803) 298-2069
Knox Broom (803) 298-2637

Specialization

Fluor Daniel has provided engineering and construction for more than 75 fossil, 33 nuclear and 40 cogeneration units plus operating and maintenance services for more than 170 operating fossil and nuclear units. Fluor Daniel also has experience in waste-to-energy, hydro, solar and geothermal projects.

Fluor Daniel provides services through the entire life cycle of your operations, from conception to design and construction through the start-up and continued operations of your facility.

Products/Services

Fluor Daniel provides innovation through technology to the power industry in a safe, high-quality, flexible manner. In addition to our engineering and construction services, we provide site studies, automation, commissioning, project financing, training and technical services. Other operating plant services include maintenance, emergency services, retrofits, upgrading, telecommunications, plant life extension and betterment, and operating training.

Company Statement

Fluor Daniel strives to anticipate and understand client's needs, develop innovative solutions of unmatched value and lead the client and Fluor Daniel to a mutually rewarding relationship. By delivering quality services, Fluor Daniel helps clients attain a competitive advantage in the Power market.

From small maintenance and modification projects to the largest engineering and construction programs, Fluor Daniel offers technical excellence, project performance and management expertise . . . plus that extra measure of value that guarantees success.

GE INDUSTRY & UTILITY SALES

See Plant Equipment, Parts, Systems

GIBBS & HILL, INC.

11 Penn Plaza
New York, NY 10001

Phone (212) 216-6000
Established 1911

Contacts

William J. Grabske, President
(212) 216-6271
Paul D. Chaffee, Sr. Vice President
Business Development
(212) 216-7032
James Mackey, Sr. Vice President
Power & Industrial (212) 216-6274

Specialization

Extensive power engineering experience includes fossil, nuclear, waste-to-energy, cogeneration and combined cycle plants worldwide. Gibbs & Hill's capabilities extend far beyond high-performing conventional plants. Gibbs & Hill is a recognized leader in advanced technologies including compressed air energy storage (CAES) and fluidized bed combustion. Areas of expertise include plant retrofits, fuel conversions, system modifications, environmental assessments and licensing and transmission and distribution.

Products/Services

Gibbs & Hill provides full scope engineering and design services including: feasibility studies, preliminary and detailed design, procurement, consulting, expert testimony, QA/QC, environmental assessment/licensing, project management, expediting, estimating, scheduling and cost control.

Company Statement

Gibbs & Hill, a Hill Group company, is an internationally recognized firm that provides a full range of engineering, design and project management services to the power, environmental and transportation industries. Headquartered in New York City, Gibbs & Hill applies its experience and capabilities to projects throughout the world from strategically located offices on four continents.

SUPPLIER DIRECTORY

GILBERT/COMMONWEALTH, INC.

P.O. Box 1498
Reading, PA 19603

Phone (215) 775-2600
Established 1906

Contacts

William F. Sailer, Vice President Utility Services (215) 775-2600 ext. 7543
Robert A. Burns, Vice President Government and Industrial Services (215) 775-2600 ext. 7082

Specialization

Our fossil business unit capabilities supply full service to cogeneration projects as well as fluidized bed combustion. Supporting our commitment to providing a high caliber of service, Gilbert/Commonwealth engineers developed the NUCLEX Program, a strategic action plan designed to promote and maintain nuclear excellence. From playing a central role in restart operations for nuclear facilities like Sequoyah Unit 2 and Peach Bottom to managing quality improvement efforts at a major petroleum facility on Alaska's North Slope, we apply our broad base of tested expertise to providing specialized service for the energy industry.

Products/Services

Gilbert/Commonwealth services our market with our seven strategic business units concentrating on key markets, such as fossil, industrial, nuclear, government, quality assurance, international, and transmission and distribution. Project development assistance, due diligence and construction management services outline the capabilities of our fossil business unit. Our industrial business unit is extensively qualified in the areas of the automotive, paper products, food and beverage, and electronics industry. Within the nuclear business unit, we emphasize our experience in plant betterment, specialty services and system upgrades.

Company Statement

Providing consulting, engineering and support services of the highest quality to utility, industrial and government clients worldwide allows us to meet today's new technological challenges successfully with effective strategies and effective solutions. We will match our performance to your goals with high quality work completed on schedule and within budget.

INTERGRAPH CORPORATION

See Computer Systems, Software

MK-FERGUSON COMPANY

One Erieview Plaza
Cleveland, OH 44114

Phone (216) 523-5600
Established 1918

Contacts

Al Bliss (216) 523-3487
David Hartsfield (216) 523-5909

Specialization

MK-Ferguson offers design, engineering, construction, ownership and operation services to the energy generation and nuclear fuel cycle markets. Experience and capabilities in the energy generation market include fossil electric power generation, nuclear electric power generation, nuclear fuel handling, alternate electric generation technology, municipal solid waste to energy and cogeneration. The nuclear fuel cycle market consists of fuel conversion, enrichment, fabrication and reprocessing; waste processing, storage and handling; decontamination and decommissioning.

Products/Services

~~A staff of~~ over 5000 professionals, including engineers, technicians and construction management personnel, provides a full range of expertise spanning the entire project spectrum. These services ~~include~~ feasibility studies, rate and systems, licensing/regulatory, consulting services; design and engineering; project development; civil, structural, electrical, mechanical construction; engineering, procurement, and construction management; plant testing and startup; plant maintenance; pollution abatement and control; nuclear fuel cycle operations and management services; environmental planning and control; energy conservation services.

Company Statement

MK-Ferguson Company is a major subsidiary of Morrison Knudson Corporation, one of the largest engineering and construction organizations in the world with experience in over 80 countries. Today, MK-Ferguson operates as an international firm engaged in design, engineering, construction and construction management in a wide range of markets.

RILEY CONSOLIDATED, INC.

See Plant Equipment, Parts, Systems

ROHM AND HAAS

See Plant Equipment, Parts, Systems

SARGENT & LUNDY

55 E. Monroe Street
Chicago, IL 60603

Phone (312) 269-2000
Established 1891

Contacts

Ken T. Kostal, Partner & Manager, Services Department (312) 269-7713
Art Brearley, Associate & Head, Marketing Services (312) 269-3802
Ron J. Wohlwend, Head, Business Development (312) 269-6651

Specialization

Sargent & Lundy has dedicated its engineering to one field—power, designing 700 electric generating units. Fossil-fuel installations include coals, lignite, gas, oil, municipal refuse, culm, and others. Our 25 nuclear units include PWR, BWR, and HTGR plus services provided at over 80 operating units. Current projects include cogeneration, combined cycle, FBC, combustion turbines, solar, a new PWR station, engineering for operating nuclear and fossil stations, transmission lines, and substations.

Products/Services

Services include: Engineering new facilities; Betterment/retrofit for fossil-fired stations; Nuclear services, including analyses, retrofit design, and resolution of licensing issues; Engineering for new transmission lines and substations and upgrades; Estimating, specification, and procurement assistance; A full range of study capabilities for power-related applications. We provide services as full-scope project engineering and management or as engineering assistance to our clients' own staffs.

Company Statement

We have always specialized in power—and remain committed to serving clients' power-related needs today. Each new project benefits from past experience and from the innovative solutions created by our engineers. The firm is a Partnership, and each Partner is a registered professional engineer actively engaged in the business. Our current projects from long-time and first-time clients reflect our diverse capabilities and the confidence that clients place in our responsive service.

TEXACO, INC.

See Plant Equipment, Parts, Systems

UNITED ENERGY SERVICES CORPORATION

1640 Powers Ferry Road, Building 11
Marietta, GA 30067

Phone (404) 951-8989
Established 1981

Contacts

G. Carl Andognini, Sr. Vice President, Scottsdale, AZ (602) 951-1191
James P. O'Hanlon, Vice President, Marietta, GA (404) 951-8989
Fred W. Symons, Vice President, Reading, PA (215) 375-0051

Specialization

United Energy Services Corporation is a professional engineering, management and technical services organization, specializing in operations support to the energy industries, and particularly to nuclear and fossil electric utility companies. Attention is focused on establishing the requirements for each task and the identification of the needs and desires of our clients, so that the services of individuals with just the right mix of talent and directly applicable experience can be provided. As always, there is strict adherence to the highest standards of business and professional ethics.

Products/Services

Qualified professionals with extensive nuclear and fossil plant operations, maintenance and technical field experience can successfully complete any project, from start-up to efficient operation. Experience and proven expertise include: Management Services; Cogeneration Support; Engineering and Technical Services; Operations Services; Maintenance Services; Training; Planning and Scheduling; Project Controls Services; Radiological Protection Services; Environmental and Radwaste Management Services; Computer Support Services; Configuration Management Services; Licensing and Regulatory Compliance Support; and Operational Assessments of all types.

Company Statement

United Energy Services Corporation was founded in 1981 as a private enterprise dedicated to providing the highest quality of professional operations services. Gilbert Associates, Inc. became aware of UESC's reputation of providing superior performance to electric utility clients through the use of carefully selected personnel with previous "hands-on" operating plant experience, and acquired UESC from its owners and founders in 1984. UESC continues to be held in the highest regard when complex problem solving reliability and timeliness are demanded.

UNITED ENGINEERS & CONSTRUCTORS

30 South 17th Street, P.O. Box 8223
Philadelphia, PA 19101

Phone (215) 422-3000
Established 1928

Contacts

Thomas H. Zarges, Vice President, Business Development (215) 422-4400
Charles Q. Miller, Vice President, Power Division (215) 422-3931
Werner J. Poelck, Vice President, Maintenance Div., UE&C-Catalytic (215) 422-4150

Specialization

Engineering, construction, and maintenance services for fossil and nuclear generating plants, including major modifications and plant life extension. Special expertise in fluidized bed combustion, fuel handling and storage, environmental systems, control systems engineering, energy economics, and regulatory consulting. Experience for today's needs based on engineering and construction of 62,000 MW generating capacity since 1960. Nuclear experience: engineering, construction, or maintenance at two-thirds of U.S. nuclear plants. Fossil experience: 100+ new generating units, full range of fuels.

Products/Services

Services: Engineering, conceptual and detailed design, procurement, construction/construction management, modular construction, contract maintenance, outage and other operations support, QA programs. Provide specialized nuclear equipment. Full range of studies: including plant life extension analysis and planning, feasibility, siting, environmental, maintenance audits. Consulting: licensing and prudency support, energy economics, trust indenture services, rate analysis, documentation review. Full range of project planning and scheduling, cost analysis, CADD and modeling services.

Company Statement
United Engineers & Constructors, a Raytheon Company, is headquartered in Philadelphia and maintains engineering offices in Boston; Chattanooga; Chicago; Denver; Greenville, SC; Knoxville and Kingsport, TN; Pittsburgh; Valley Forge, PA; West Palm Beach, FL; Winston-Salem; and London, England. United has performed projects throughout the United States, including Puerto Rico and the Virgin Islands, and has served on recent generating projects in Canada, India, Italy, Saudi Arabia, Venezuela, and Yugoslavia.

WESTINGHOUSE ELECTRIC CORPORATION
See Plant Equipment, Parts, Systems

PLANT EQUIPMENT, PARTS, SYSTEMS

ADVANCED NUCLEAR FUELS CORPORATION
See Fuels

ASEA BABCOCK
See Plant Design, Engineering, Construction

BABCOCK & WILCOX-FOSSIL POWER DIVISION
See Plant Design, Engineering, Construction

BABCOCK & WILCOX—TUBULAR PRODUCTS DIVISION
640 Keystone Street
Alliance, OH 44601

Phone (216) 821-5700
Established 1904

Contacts
Jim Marshall (216) 829-5257
Sam Tripp 1-800-521-9694
Sandy Hawkins 1-800-521-9694

Specialization
The Babcock & Wilcox Tubular Products Division is a leading supplier of carbon and alloy specialty tubing and high nickel seamless tubing for pressure applications. Tubing meets ASTM specifications A-513, A-178, A-250 and customer specifications. As a separate service, full periphery ultrasonic testing is available to increase the assurance of high quality tubing for boiler and high pressure applications.

Products/Services
B&W's welded OD range is 1.000 to 10.750 inches, with walls 0.083 to 0.688 inches. The seamless OD range is 0.200 to 4.00 inches. Full periphery ultrasonic testing is offered with tubing orders, or as a custom service, for tubing with OD's from 0.750 to 5.250 inches and lengths to 65 feet.

Company Statement
B&W began making tubular products in 1904 and has a long standing reputation for furnishing high quality tubing. The division recently completed a $28 million mill modernization program to increase its capability to product specialty tubing.

BAILEY CONTROLS, DIVISION OF BABCOCK & WILCOX
See Meters/Instrumentation/Testing

BECHTEL POWER CORPORATION
See Plant Design, Engineering, Construction

BECHTEL-KWU ALLIANCE
See Plant Design, Engineering, Construction

COMBUSTION ENGINEERING, FOSSIL SERVICES DIVISION
1000 Prospect Hill Road
CEP-7025-GC26
Windsor, CT 06095

Phone (203) 688-1911
Established 1912

Contacts
Donald E. Bodell (203) 285-9337
Greg R. LaRocque (203) 285-9826

Specialization
Fossil Services, a division of Combustion Engineering's Power Services Group, is an organization of dedicated product/service experts with the full range of capabilities required to maintain, modify and upgrade fossil fuel fired Power Generation Equipment. The overall objective of Fossil Services is to maximize equipment efficiency, availability and reliability.

Products/Services
Fossil Services provides the material, construction, engineering and technical services required for the maintenance and modification of fossil fuel fired Power Generation Equipment. Major clients are Electric Utility and Industrial companies. Product/Services include:
- complex project development and management
- spare and replacement parts
- engineered components
- inspection and technical services
- engineering studies
- on-site maintenance construction services
- component and equipment installation
- power plant operation and maintenance

Company Statement
Combustion Engineering, Inc., is a leader in the power generation and process industry markets on a worldwide basis. As a full-scope supplier of power equipment and maintenance services, C-E offers products and services that range from providing a complete turnkey project to the manufacture of equipment and related instrumentation and controls for a specific project. More than 40 percent of the free world's electric power currently is generated by equipment of C-E design.

DIAMOND POWER SPECIALTY COMPANY
2600 East Main Street
Lancaster, OH 43130

Phone (614) 687-6500
Established 1903

Contacts
Dana S. Ellefson, General Marketing Manager (614) 687-4166
Jon C. Woodward, Western Operations Manager (614) 687-4029
Thomas J. Dunn, Eastern Operations Manager (203) 348-4767

Specialization
Diamond Power is a leading supplier of boiler cleaning systems, drum level indicating systems and reflective insulation to the electric utility industry. Diamond Power sootblowers are specifically designed to clean the various regions of the boiler from the furnace to the stack utilizing control systems for flexible, efficient operation in varying conditions. Drum level equipment is designed to meet ASME requirements for state-of-the-art water level indication and control. Mirror® insulation is a reflective insulation designed for performance and service requirements on nuclear steam generators.

Products/Services
Diamond Power product performance is complemented by factory trained field service representatives. These representatives are available for "start-ups" and boiler evaluations as well as normal maintenance services. In addition to resident service technicians, Diamond Power has six strategically located service centers that inventory spare parts and offer full product rebuild capabilities. A mobile repair van for on-site repairs provides significant reductions in material and freight costs.

Company Statement
Founded in 1903, Diamond Power has become a world leader in boiler cleaning technology by identifying and solving cleaning problems as well as meeting market requirements for drum level indication. The concept of providing high quality products supported by an extensive field service network has become a tradition at Diamond Power.

GE ENVIRONMENTAL SYSTEMS

200 North Seventh Street
Lebanon, PA 17042

Phone (717) 274-7000
Established 1935

Contact
Edward C. Lowe, Vice President
Marketing (717) 274-7064

Specialization
Complete engineering design, manufacture, construction, and servicing capability for air pollution control systems controlling particulate, sulfur dioxide, and acid gas emissions in flue gases produced by electric power generation boilers.

Products/Services
GE Environmental Systems is a worldwide leader in air quality control technology and services. Our products include wet and dry flue gas desulfurization (FGD) systems, dry acid gas scrubbing (DAGS) systems for solid waste incineration, custom design fabric filters and modular baghouses, electrostatic precipitators and associated control systems, mechanical collectors, Buell cyclones, and mechanical classifying equipment. GE also engineers and installs systems for treatment and disposal of wastes from wet FGD systems. After-market services include replacement parts, state-of-the-art electrostatic precipitator control system upgrades, inspections and evaluation services, on-site Operation and Maintenance Programs, and upgrading or rebuilding all types of air pollution control equipment and systems.

GE INDUSTRY & UTILITY SALES

Bldg. 2 Room 111
1 River Road
Schenectady, NY 12345

Phone (518) 438-6500
Established 1878

Contacts
David W. Houghtaling (Systems Engr. & Software) (518) 385-5943
Donald M. Kusza (Utility Sales) (518) 385-3563

Specialization
Power Generation, power distribution and control, and air quality control products, diagnostic testing and full-scope power generation and distribution services for GE and non-GE equipment in public and private electric utilities, rural electric co-operatives, municipals and general process industries.

Power systems engineering including power generation, power delivery and power utilization planning, design, performance analysis and problem-solving. Special areas of expertise include the design of high voltage direct current (HVDC) and static var control (SVC) systems, evaluation of system stability, turbine-generator protection, analysis of control performance/interaction problems, evaluation of least-cost planning alternatives, multi-area production cost simulation, optimization of power flows and transmission line research and testing.

Products/Services
Primary products: turbine-generators, transformers, switchgear, meters, AC-DC motors and generators, air pollution control equipment, lighting, and drives and controls. Service scope: from product installation and maintenance support to turnkey design/construction including advice/consultation; parts; equipment/systems installation; equipment uprates, maintenance, overhaul and repairs; contract maintenance; PCB service including disposal, transformer retrofits and risk analysis; system modernization and rehabilitation; power plant and substation design/construction; power plant operation and maintenance.

Studies, software, consulting, and educational programs for electric utilities and industrial power projects. Generation studies include turbine-generator torsional analysis, control interaction, economic evaluations, and expansion planning. Studies for power delivery and utilization include HVDC system design, harmonics analysis, transmission and distribution system protection, overvoltage analysis and insulation coordination. GE offers production cost simulation software, and security constrained optimal power flow software. Power Systems Engineering Course offered in Schenectady, NY.

Company Statement
GE Industrial & Power Systems is a $5 billion business with over $1.7 billion of invested capital, major investments in new equipment and R&D, employing 45,000 people in 32 manufacturing plants with a worldwide sales and service network of 89 shops and 255 engineering and sales offices; a business committed to supporting the over 12,000 GE turbine-generators operating worldwide with life extension and performance improvement programs and to maintaining state-of-the-art product and service technology.

HUDSON PRODUCTS CORPORATION, DIVISION OF BABCOCK & WILCOX

P.O. Box 36100
Houston, TX 77236

Phone (713) 785-4000
Established 1946

Contacts
G. E. Kluppel (713) 972-8132
Neil Carpenter (713) 972-8155
Don Socher (713) 972-8180

Specialization
Heat-Flo™ heat pipe air preheaters have exceptional potential for energy conservation on utility boiler system. Our initial installations and field testing of retrofit projects indicate a restored power output from boilers and heaters in excess of 11 percent as compared to the previous regenerative air heaters. The Stac-Flo™ air-cooled, vacuum steam condenser system is used for project locations wherein cooling water is not available or environmental permit problems preclude the use of water-cooled condenser.

Products/Services
Hudson has designed and fabricated over 10,000 Fin-Fan™ heat exchangers which are installed at worldwide locations. Hudson's Tuf-Lite™, fiberglass reinforced plastic (FRP) fans are used in cooling towers and by air-cooled manufacturers throughout the world. The Hudson Hy-Fin™ extruded aluminum finned tubing is the premier tubing for continued, high heat transfer performance and for resistance to atmospheric corrosion.

Company Statement
Hudson has been designing and manufacturing heat transfer products for use in the electric utility and hydrocarbon processing industries since 1946. At our Houston, Texas facilities continuous research and development programs complete with full scale testing have enabled Hudson to provide products which have become world standards for quality and performance. The Hudson air-cooled heat transfer products are easily recognized by the trademarks which are a symbol of excellence.

RILEY CONSOLIDATED, INC.

5 Neponset Street, Box 15040
Worcester, MA 01615

Phone (508) 852-7100
Established 1913

Contacts
J. C. Welling, Vice President Sales
M. J. Lynch, Manager, Training & Development/Advertising

Specialization
Riley Stoker Corporation, one of the Riley Consolidated Companies, is a designer, manufacturer and constructor of steam generating and fuel burning equipment for utilities and industries. Through its Power Services Division, the company provides replacement parts, expert repairs and specialized services for all boilers and auxiliaries.

Products/Services
- Traditional steam generating units
- Fluidized bed boilers
- Municipal solid waste-fired boilers with Takuma grates
- Boiler Evaluations/inspections
- Replacement parts

ROHM AND HAAS COMPANY

Independence Mall West
Philadelphia, PA 19105

Phone (215) 592-6829
Established 1909

Contacts
Russ Saunders (215) 592-3177
Nancy Caulfield (215) 592-3250

Specialization
Rohm and Haas Company is the pioneer of and worldwide leader in ion exchange technology. For 50 years we have provided electric utilities with Amberlite ion exchange resins for purification of water in their make-up deionization, condensate polishing, and blowdown demineralization systems. Our high quality Amberlite resins have the physical and chemical properties necessary to produce very high purity water, which is essential in minimizing corrosion products and equipment maintenance, thereby extending plant life.

Products/Services
Rohm and Haas Company offers a wide range of ion exchange resins to meet the needs of fossil and nuclear utilities in:
- General Deionization
- Condensate Polishing
- Nuclear—Primary Water Chemistry Control
- Radioactive Waste Treatment

As a service to current and potential customers our laboratory analyzes the condition of resin samples. This service is intended to assist resin users in troubleshooting water treatment problems and in determining whether their ion exchange resins are suitable for continued use.

Company Statement
Rohm and Haas Company is an international specialty chemical company which manufactures over 2,500 products for industry. Our corporate objective is to understand customer needs

and to provide the highest quality products and best possible service.

A recent $15 MM investment in our ion exchange production facility and our extensive research and development programs demonstrate our commitment to this objective and ensure a future of technically advanced, high quality, Amberlite products for the utility industry.

SYSTEMS CONTROL, A DIVISION OF POWER AUTOMATION, INC.
See Computer Systems, Software

TEXACO INC.
2000 Westchester Avenue
White Plains, NY 10650

Phone (914) 253-4000
Established 1902

Contacts
Madeleine R. Marchese
(914) 253-4003
Vernon R. Shorter (914) 253-4040
Paul F. Curran (914) 253-7325

Specialization
Texaco has developed a process for the conversion of coal into electric power. This technology, known as the Texaco Coal Gasification Process, has the capabilities of reliably and economically producing power with unmatched environmental performance.

Through participation in the 120-MW Cool Water plant and through working with numerous utilities, Texaco has experience in addressing utility needs. Services are available for a full range of gasification project needs ranging from feasibility studies to operations.

Products/Services
The Texaco Coal Gasification Process provides a synthesis gas (principally carbon monoxide and hydrogen) and steam to drive the turbines of an integrated gasification combined-cycle power plant.

Plants can be designed with efficiencies of over 40% and an environmental cleanliness that can be matched by no known alternative for burning coal.

Company Statement
Texaco has over 40 years of successful gasification experience. Texaco Gasification has been proven versatile, safe and dependable in over 90 commercial plants around the world. Four commercial Texaco coal gasification facilities have gasified a wide variety of coals with a full range of sulfur content and ash fusion properties.

UNITED ENERGY SERVICES CORPORATION
See Plant Design, Engineering, Construction
See Management Consulting/Research/Training

UNITED ENGINEERS & CONSTRUCTORS
See Plant Design, Engineering, Construction

UTILITY POWER CORPORATION
P.O. Box 180
Bradenton, FL 34206

Phone (813) 723-4100
Established 1970

Contacts
D. W. Fields (813) 723-4154
J. R. Thompson (813) 723-4250
R. J. Baumgartner (813) 723-4143

Specialization
Utility Power Corporation (UPC) specializes in power generation equipment designed, engineered and manufactured by our parent company, Siemens KWU. UPC specializes in providing new equipment of Siemens KWU design, as well as applying Siemens KWU technology to existing units of any manufacture.

Products/Services
Utility Power Corporation provides steam turbine-generators as well as the Model V84 and Model V64 gas turbines. UPC currently has fifteen large steam turbine-generators of Siemens KWU design in operation around the country, and two Model V84 gas turbines. Additionally, UPC is experienced in providing replacement, repair and upgrade services for turbine-generators of any manufacture.

Company Statement
Utility Power Corporation brings Siemens KWU power generation technology to the United States. As a member of the Siemens group of U.S. companies, UPC is backed by the strong financial and technological strength of the Siemens Corporation. UPC supplies Siemens KWU-designed steam turbine-generators, gas turbines and related services.

WESTINGHOUSE ELECTRIC CORPORATION
The Quadrangle
4400 Alafaya Trail
Orlando, FL 32826-2399

Phone (407) 281-2000
Established 1886

Contacts
Power Plant Projects (407) 281-2000
Steam Turbine Generator
Modernization and Service
(407) 281-2000
Combustion Turbine Sales and
Service (407) 281-2000

Specialization
Westinghouse Power Generation specializes in manufacturing, modernizing, and servicing electrical generation equipment for a wide variety of applications. Westinghouse offers its customers a complete, high quality line of products ranging from small cogeneration equipment to the largest steam turbine generators for nuclear power plants. With over a century of experience serving the electric utilities on every continent, Westinghouse is firmly established as a world class supplier of cost-effective, reliable power generation equipment.

Products/Services
Westinghouse Power Generation offers a complete line of high quality steam turbine generators and combustion turbines. In addition to new apparatus, Westinghouse offers the Ruggedized product line, enabling utilities to integrate the latest technology into their existing equipment. All Westinghouse machines benefit from an extensive field service network. From portable boring machines to advanced artificial intelligence diagnostics capabilities, Westinghouse assists its customers in achieving the best performance statistics for their steam turbine generators in the industry.

Company Statement
Westinghouse intends to enhance its position as a world-class, global competitor, the supplier of preference to the power industry.

WHEELABRATOR AIR POLLUTION CONTROL, INC.
441 Smithfield Street
Pittsburgh, PA 15222

Phone (412) 562-7300
Established 1913

Contacts
Arthur Reisinger (412) 562-7265
Bill Kissick (913) 345-9712
Martin Downey (713) 591-0742

Specialization
Wheelabrator Air Pollution Control engineers and markets air pollution control equipment and systems, which includes complete design engineering, erection, start-up, testing, servicing and financing of small and large-scale air pollution control facilities.

Products/Services
Wheelabrator offers a full range of air pollution control equipment and services. Products include custom and standard-designed fabric filters, electrostatic precipitators, mechanical collectors, and flue gas desulfurization and other acid gas removal systems. Aftermarket services provide replacement parts, inspections and evaluation services, on-site training programs, and upgrading or rebuilding of all types of air pollution control systems.

SEMINARS • ASSOCIATIONS • PUBLICATIONS

CAMBRIDGE REPORTS, INC.
See Management Consulting/ Research/Training

TRANSMISSION • DISTRIBUTION SYSTEMS

ALLIED SIGNAL METGLAS PRODUCTS
6 Eastman's Road
Parsippany, NJ 07054

Phone (201) 581-7707
Established 1979

Contacts
Pam Pemp (201) 581-7702
Peter Manos (201) 581-7707
Patrick Curran (201) 581-7676

Specialization
The world's most efficient distribution transformers are made using Allied Signal's METGLAS® transformer core alloy. Transformers built with METGLAS alloy cores have 60 to 80 percent lower no-load losses compared with traditional steel core transformers. Utilities benefit from lower operating expenses as well as reduced demand on generation and transmission facilities.

Products/Services
Distribution transformers with METGLAS alloy cores are available in pole mounted, pad mounted, and submersible varieties, with kVA sizes ranging from 300 kVA 3-phase units down to 10 kVA single-phase units.

MOVING TO METGLAS is Allied-Signal's newsletter to electric utilities. This newsletter provides the latest information on the industry situation with respect to amorphous core transformers, and is available free of charge. Contact Peter Manos at the above address.

Company Statement
Allied-Signal is an advanced technology company with businesses in aerospace, automotive products and engineered materials. 1988 sales totalled over $11.9 billion.

BLACK & VEATCH, ENGINEERING-ARCHITECTS
See Plant Design, Engineering, Construction

CHAS. T. MAIN, INC.
See Plant Design, Engineering, Construction

COOPER POWER SYSTEMS
P.O. Box 2850
Pittsburgh, PA 15230-2850

Phone (412) 777-3200
Established 1911

Contacts
Nelson P. Silfee (412) 777-3211
William H. Brazelton (412) 777-3253
Melvin J. Kappert (412) 777-3254

Specialization
Cooper Power Systems specializes in the manufacture of equipment used to transmit, control, and correct electrical energy as it moves from the generating plant to individual customer. Products are manufactured under the McGraw-Edison, Kyle, and RTE brand names.

Products/Services
Products and services include: Power Transformers, Distribution Transformers, Voltage Regulators, Power Capacitors,

SUPPLIER DIRECTORY

Air-Break Disconnect Switches, Load-Break Switches, Reclosers, Sectionalizers, Load Transfer Packages, Vacuum Fault Interrupters, Power Circuit Breakers, Surge Arresters, Fusing Equipment, Fault Indicators, Entrance/Terminating Equipment, Line Construction Materials, and other products related to the transmission and distribution of electrical energy. Analytic services and power testing are available to outside companies at McGraw-Edison's Thomas A. Edison Technical Center.

Company Statement

Cooper Power Systems, an operating unit of Cooper Industries, Inc., offers the broadest and highest quality selection of components and systems for transmitting, distributing, and managing electrical energy.

EBASCO SERVICES INCORPORATED

See Plant Design, Engineering, Construction

GE INDUSTRY & UTILITY SALES

See Plant Equipment, Parts, Systems

GIBBS & HILL, INC.

See Plant Design, Engineering, Construction

GILBERT/COMMONWEALTH

See Plant Design, Engineering, Construction

INTERGRAPH CORPORATION

See Computer Systems, Software

MEYER INDUSTRIES

P.O. Box 114
Red Wing, MN 55066

Phone (715) 792-2811
Established 1921

Contact

Robert L. Schultz

Specialization

Designer and fabricator of steel structures for electric transmission lines—encompasses both tubular and lattice structures.

Products/Services

Light Duty (LD) pole structures, weathering steel, direct embedded, light weight components, easily erected. An engineering alternative to wood structures–single pole and H-frame.

Company Statement

Meyer Industries—a leader in the engineering and fabrication of steel structures for the electric utility industry. The ability to custom design complex structures for unique applications reinforces Meyer's position in the marketplace. Our leadership role is due to innovation in manufacturing techniques and equipment, research and development in providing least cost structures.

SARGENT & LUNDY

See Plant Design, Engineering, Construction

SYSTEMS CONTROL, A DIVISION OF POWER AUTOMATION, INC.

See Computer Systems, Software

T&D EQUIPMENT AND PRODUCTS, OTHER

ALLIED SIGNAL METGLAS PRODUCTS

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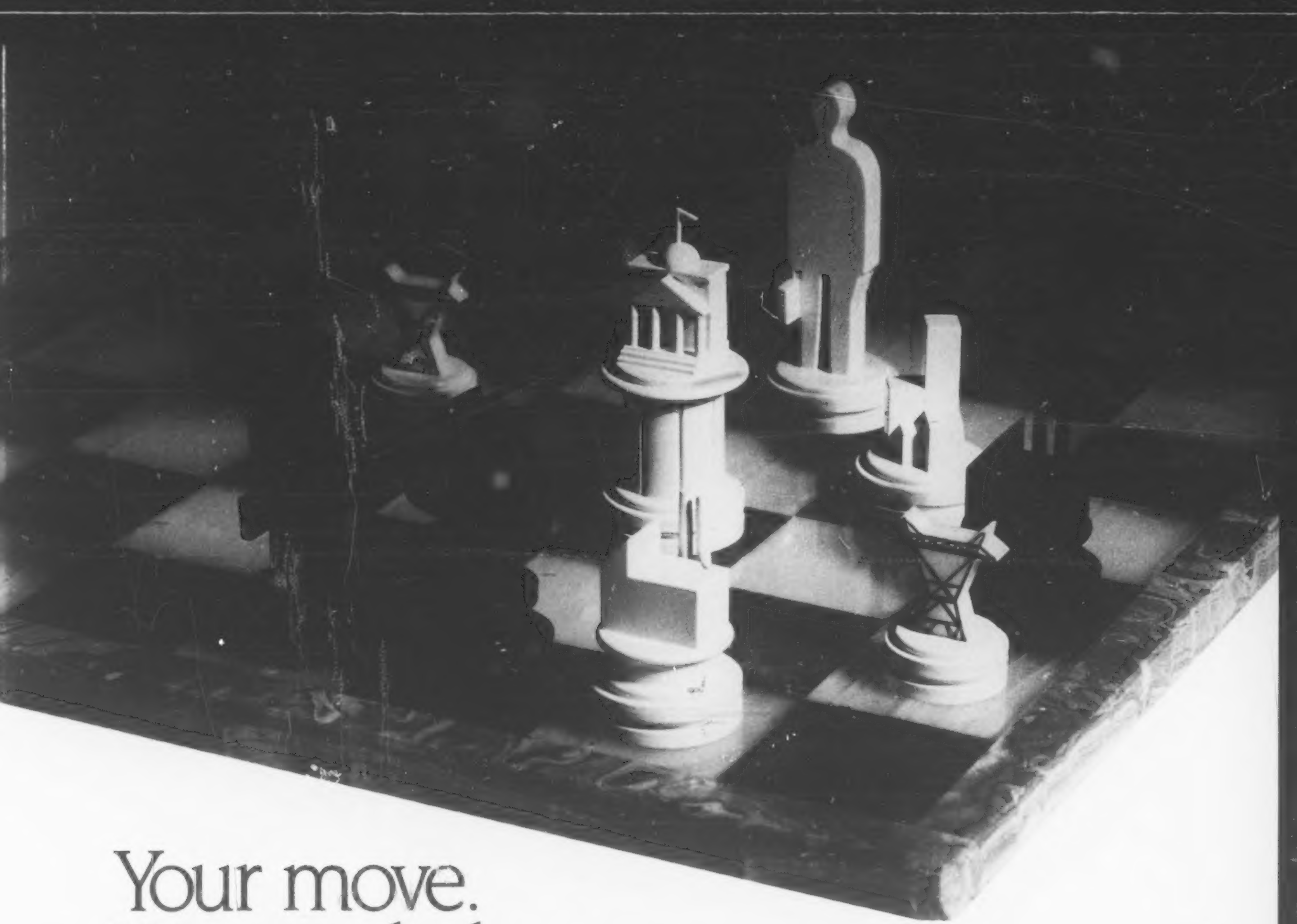
Index to Advertisers

Advanced Nuclear Fuels Corporation 60
Allied-Signal Metglas Products 27
Andersen Consulting 43, 45
Arthur Andersen & Co. 67
ASEA Babcock 3
Babcock & Wilcox-Fossil Power Division 55
Bechtel Power Corporation 47
Bechtel-KWU Alliance 8, 9
Black & Veatch, Engineers-Architects 19, 58
Cambridge Reports, Inc. 15
Cresap Management Consultants 65
Consolidation Coal Company .... Cover 4
Ebasco Services, Incorporated 33
Energy Management Associates, Inc. .... Cover 2
ENSR Operations 35
Fluor Daniel 63
GE Nuclear Energy 13
GE Industrial & Power Systems 17, 38, 39
Gilbert/Commonwealth, Inc. .... Cover 3
Kidder Peabody & Co. 69
Management Analysis Company 2
Meyer Industries 71
Nalco Chemical Company 54
Nerco Coal Corporation 31
Organizational Analysis Corporation 54
Peabody Development Company 56
Pittsburgh & Midway Coal Mining Company 37
Riley Stoker Corporation 57
Rohm and Haas Company 71
Sargent & Lundy 1
Stockholder Systems, Inc. 75
Texaco, Inc. 4
Unison Transformer Services, Inc. 29
United Energy Services Corporation 73
United Engineers & Constructors 6, 7
Utility Power Corporation 59
Westinghouse Electric Corporation .... insert and 22, 23



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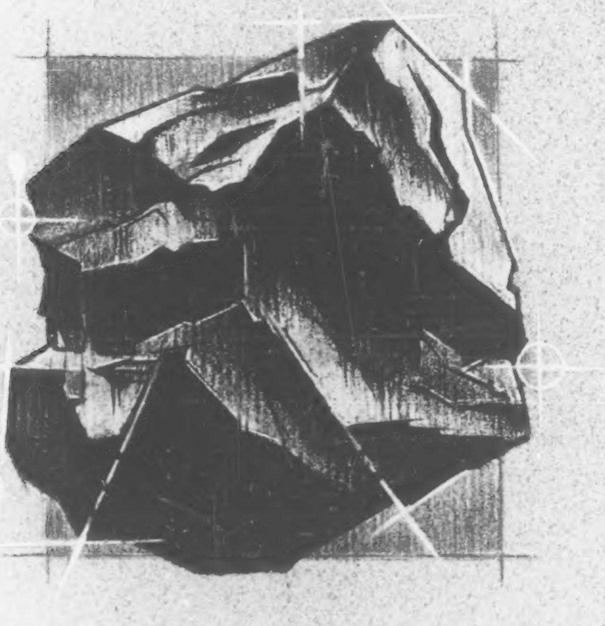

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A key part of the plan was refurbishing Minnesota Power's M. L. Hibbard Station to provide a reliable steam suppy for the new mill located 1/2 mile from the station. Built between 1931-1951, all four units of the station were semiretired in 1980. Early studies established the feasibility of converting two of the units, but dictated an ambitious 24-month schedule from authorization to completion. With the tight schedule for the project, Minnesota Power called on an AE with broad experience in fossil plant retrofits—Sargent & Lundy.

Originally designed to burn coal, Hibbard was converted to fire gas and oil in the early 1970s. The refurbished plant now burns a new fuel—a combination of coal and wood. The two boilers required extensive modifications to efficiently fire the new fuel and meet desired steam requirements. The addition of a material-handling system for both coal and wood also required major design effort.

The plant site, a 10-acre island in Duluth Harbor, presented additional considerations for meeting the project schedule because of the limited space available for construction activities and materials deliveries.

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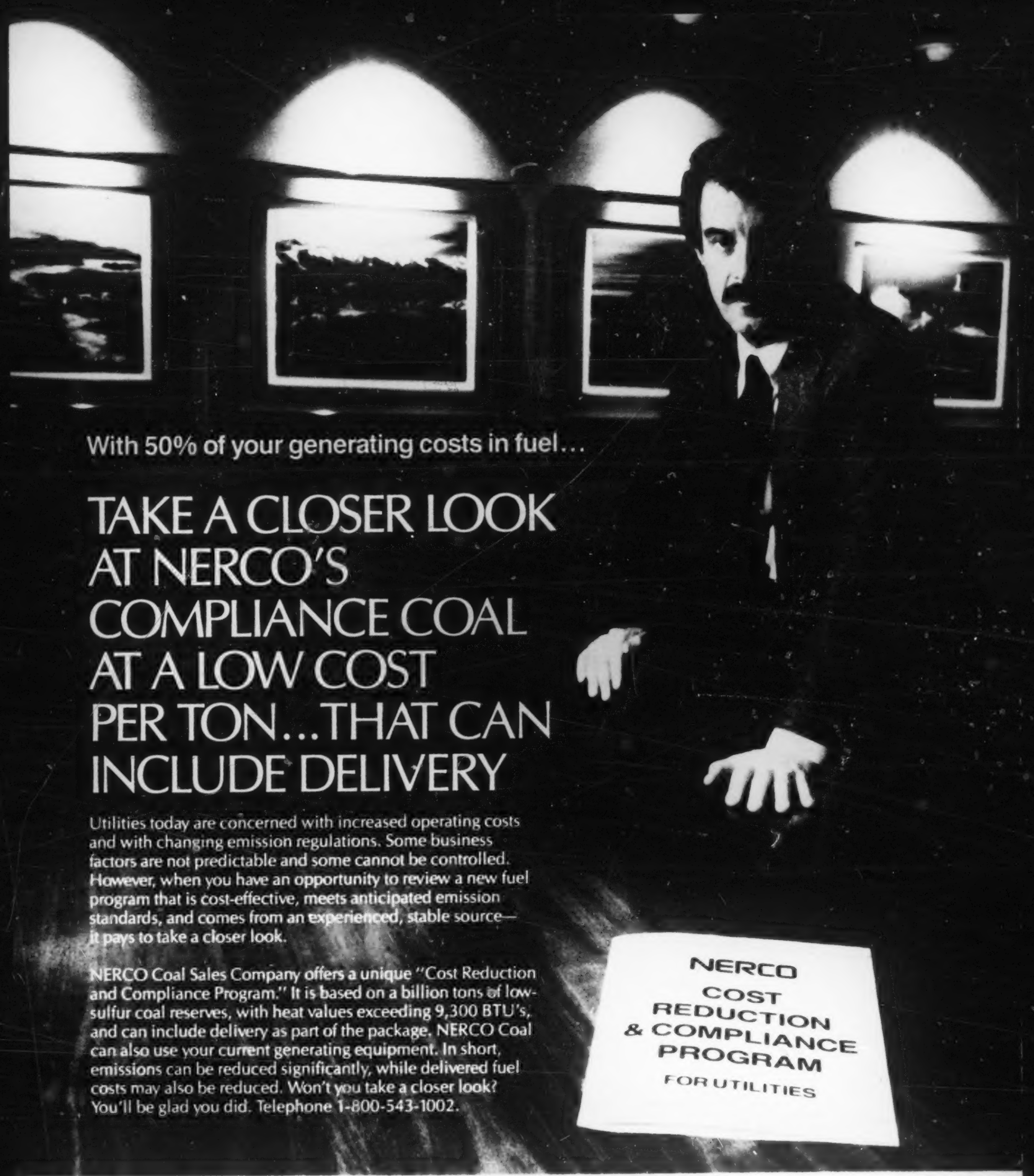

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The Magazine for Management
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CONTENTS

ELECTRIC PERSPECTIVES **JULY–AUGUST 1989**

ELECTRICITY FUTURES: AMERICA'S ECONOMIC IMPERATIVE 8

EEI Chairman outlines four goals as a framework for developing a national energy strategy for electricity supply.

By James J. O'Connor

TRANSFORMING POWER QUALITY PROBLEMS INTO MARKETING OPPORTUNITIES 16

By helping customers meet their need for high quality power, utilities can position themselves as the preferred energy supplier.

By Richard S. Tempchin and Jane Clemmensen

THE CALL TO LEAD: A COMMENTARY 28

"Leaders must understand that the employer/employee relationship is the cornerstone of any sound strategic plan."

By Bernard W. Reznicek and Mary Anne Moorman

REVIEWS

FINANCIAL REVIEW 34
TECHNOLOGY REVIEW 37
REGULATORY REVIEW 38
STATISTICAL REVIEW 39

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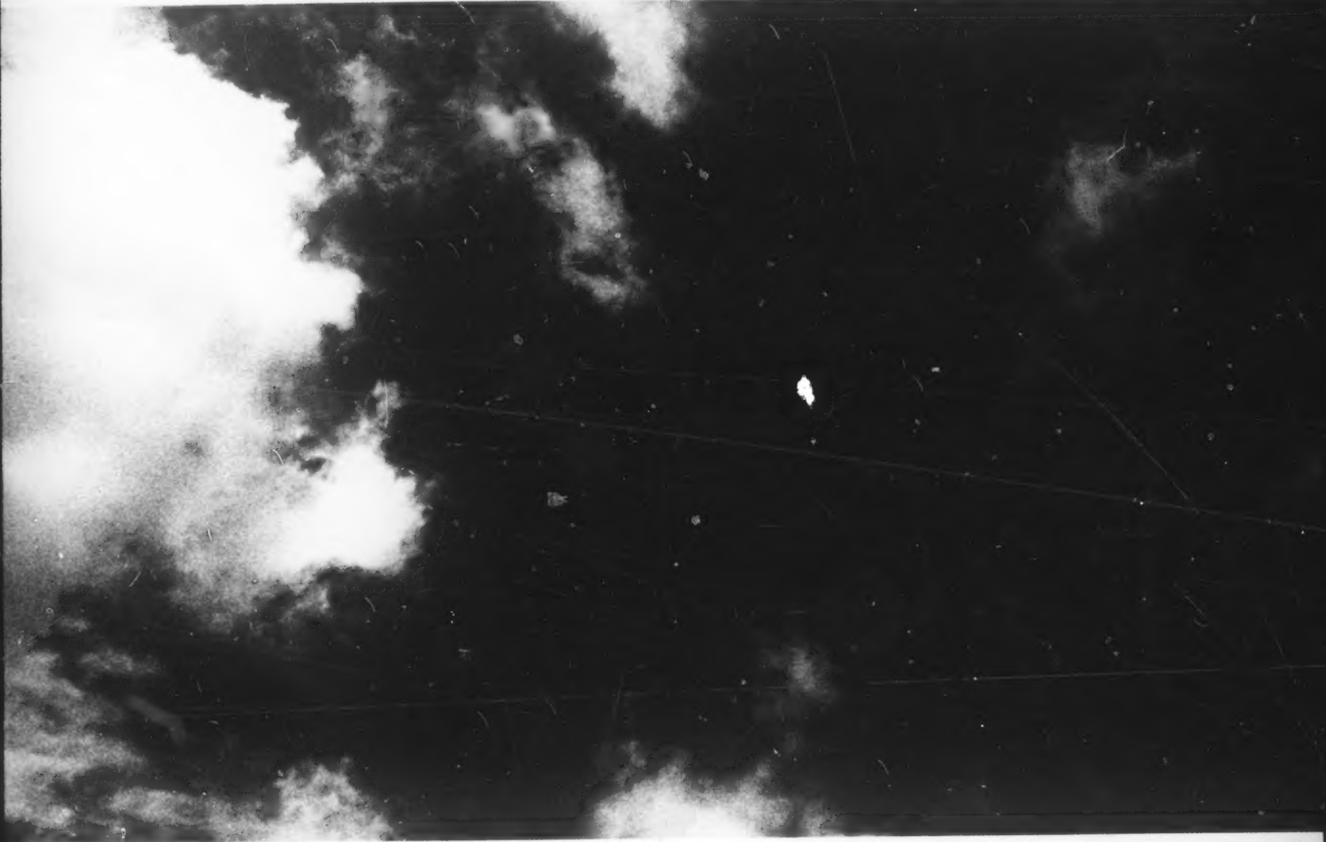

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RSPECTIVE

James J. O'Connor

Electricity Futures: America's Economic Imperative

EEI Chairman outlines four goals as a framework for developing a national energy strategy for electricity supply.

In my year as Chairman of EEI, I have had the privilege of traveling the country, speaking on electricity issues to diverse audiences. Perhaps more importantly, I have had the privilege of listening and observing. The feedback I have received is at once gratifying and disturbing—gratifying because the nation's sustained economic growth and last year's hot summer have heightened awareness, particularly in the media and in Congress, that the issues of electric load and capacity require prompt national attention, disturbing because much needs to be accomplished if we are to continue meeting the needs of our customers in a reliable manner. Allow me to suggest a framework for considering national policies which affect electricity supply.

In meeting America's 1988 demand for electric power, more than two-thirds of the 75 largest investor-owned utilities exceeded their 1990 estimates for peak demand. In spite of these increased pressures, each of our nation's utilities met our customers' demands while taking steps to prepare for a future that is approaching faster than any of us realized just a few years ago.

Preparing for Future Demand

To better define electricity growth forecasts, EEI conducted two years of intensive analysis of social, technological, and economic trends that will affect the United States over the next 25 years. The report—entitled *Electricity Futures: America's Economic Imperative*—is helping the industry understand and prepare for the forces that will determine electricity use beyond traditional 10-year planning periods.

The study projects that, as America's population growth rate declines, the rate of growth in our labor force will also shrink. Business and industry will have to depend more on productivity improvements for economic growth. Technologies based on electricity will continue to have a profound impact on increasing the productivity of America's workforce.

At the same time, households will become smaller as the number of single adult households increases. However, the impact of less electricity use by smaller households will be offset by the proliferation of new electricity-based home services and appliances.

Talk of a growing service-oriented economy notwithstanding, the study projects that industrial production will continue to play an important role in our nation's economy. American manufacturing will continue to move away from high volume and low value added sectors that depend on raw materials and standardized production. In its place will stand manufacturing that is high value added and low volume.

Businesses used to compete with one another across the city; now they compete across the globe. Therefore, business success will rely on gaining and keeping the edge in global marketing, production, and distribution. Some 70 percent of the goods produced by American businesses are competing directly with goods produced abroad.

To stay competitive, American manufacturing will adopt technological innovations relying on electricity—technology that brings the flexibility of advanced variable speed motors . . . technology that brings cost and quality controls by automating the factories of the future . . . technology that brings the precision of lasers and microwaves.

These forces, many of which are already at work, will lead to modest but steady growth in electricity use through the year 2000. In contrast, total energy use will grow at about half the rate of electricity demand.

This means electricity's share of the nation's energy mix will continue to expand, even as the country adopts more efficient uses of electricity. By 2015, the nation's economy will require about 26 percent less total energy per real dollar of Gross National Product.

James O'Connor is Chairman and CEO of Commonwealth Edison Company. This article is adapted from a speech he delivered as Chairman of Edison Electric Institute at EEI's 1989 annual convention held in Portland, OR, June 5–7. The report from which he took the title of his address is summarized in the March-April 1989 issue of Electric Perspectives.

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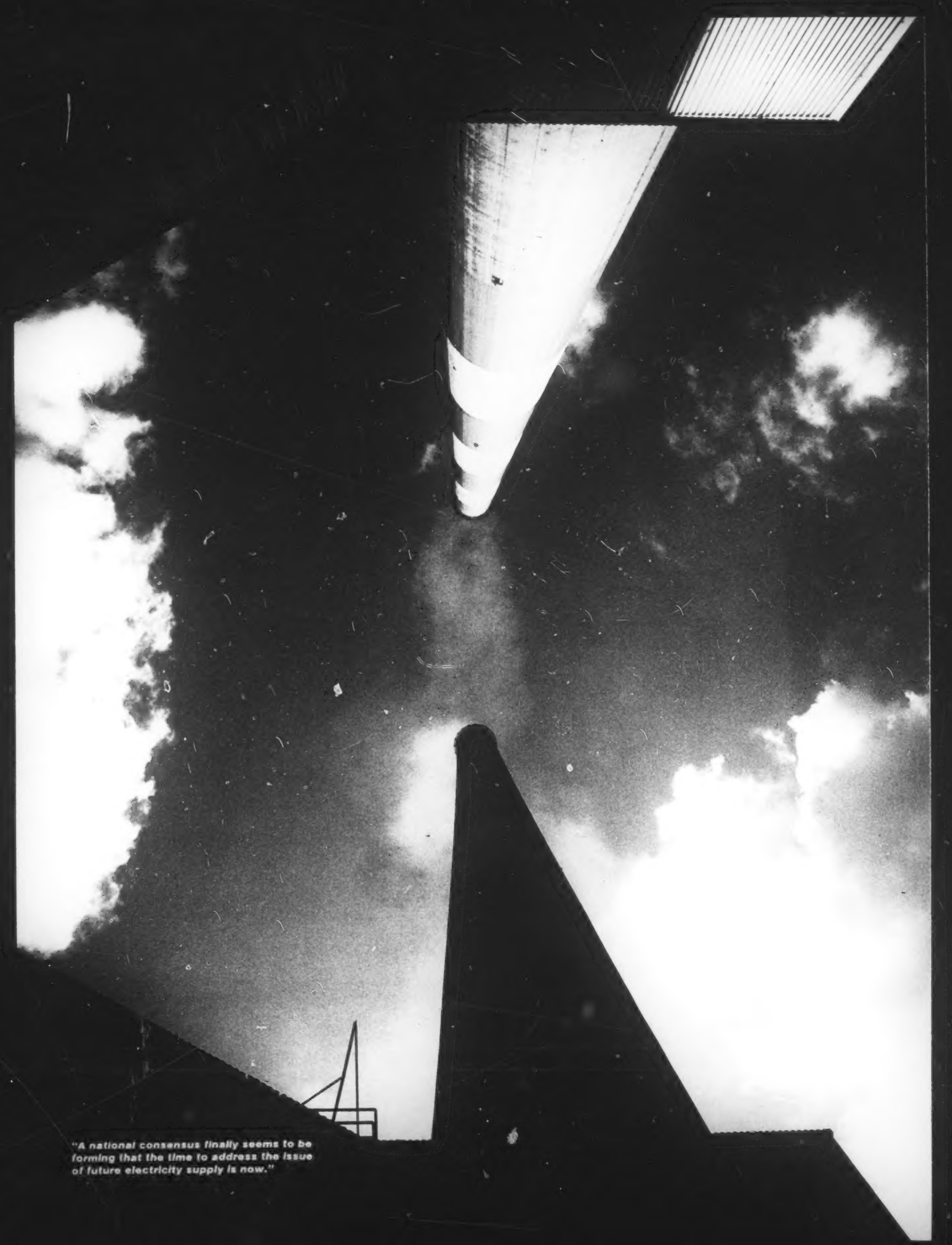

"A national consensus finally seems to be forming that the time to address the issue of future electricity supply is now."

To achieve these savings, electricity's share of total end-use energy should grow from 17 percent in 1988 to about 20 percent in 2015. In short, the study reveals that economic growth, energy efficiency, and increased electricity use will proceed in tandem. That is why it is imperative that America shape broad, strategic approaches to meet this increasing electricity demand.

The Need for Cohesive, Far-Sighted Public Policies

Our nation faces fundamental issues in providing electricity supplies in a complex environment. We have all learned the difference between projecting electricity demand increases and being allowed to meet those projections.

I am concerned that our industry is becoming increasingly dependent on short-term solutions. Some utility and non-utility generators alike are deciding to rely on combined cycle turbines to meet additional electricity needs. This could signal greater dependence on gas and imported oil to fuel new capacity, rather than on domestically produced uranium and coal.

There is a clear, be it short-range, economic reason to choose turbines—they are smaller, quicker, and hence cheaper to build. However, while turbines can help handle peak loads, we must seek more efficient, long-term solutions to meet growth in baseload.

In the mid-1990s or even before, depending on the region of the country, reserve margins will shrink to the point where we *must* add new baseload plants. That time is almost here. Our nation needs consistent energy policies *now* . . . policies that suggest the overall direction of federal efforts . . . policies that are cohesive, and policies which support industry actions to meet future electricity needs in the best long-term interests of all Americans.

We must continually stress the critical importance of policies which affect the supply of electricity. Fortunately, our new Secretary of Energy, Admiral Watkins, has placed a high priority on the development of an integrated national energy strategy. Now is the time to add our encouragement to such an approach, for all the reasons in EEI's Futures Study and more. And direction has to come from the Administration—hopefully from the President himself.

Mr. Bush took an excellent step in this regard last month, when he wrote to attendees of the Nuclear Power Assembly that additional nuclear generating stations will need to be licensed and operating to help meet future energy needs.

Current regulatory and financial risks discourage utilities from building new baseload plants. At the same time, however, industry is increasingly relying on electricity-based technologies like this computer-guided plasma arc sheet metal cutter to reduce costs and boost productivity.

There would be lots of elements to a national energy strategy, and many competing interests to balance. Cohesive public policies are going to be tough to draft, and it will be even more difficult to gain a consensus. Henson Moore, Admiral Watkin's assistant secretary, recently suggested a series of public hearings as an opening step. I think that is an excellent idea—and I propose that we open the discussion immediately.

Let us focus on what should be considered in developing a national energy strategy for electricity supply. When we think of the federal

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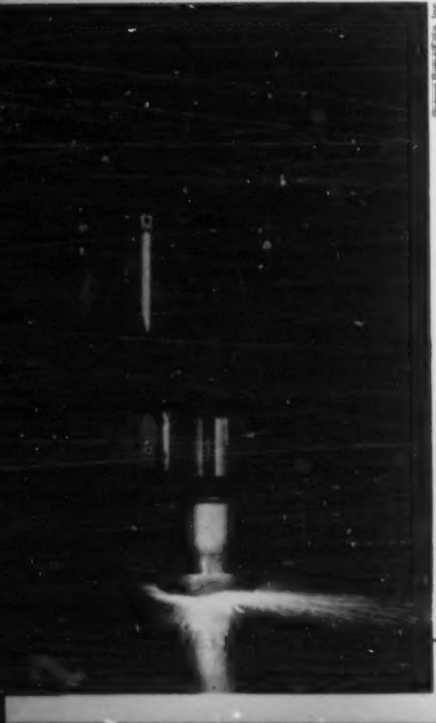

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Utilities are working with Secretary of Energy Watkins, President Bush, and others to develop the cohesive public policies needed to ensure the adequacy of the nation's future electricity supply.

government's current policy objectives, we see an assortment of programs. One example is the Clean Coal Technology Program, with its nearly two billion dollars in matching funds. These dollars are moving new technologies closer to large-scale commercial operation, and that is good.

Another example is the National Appliance Energy Conservation Act, which is expected to save consumers billions of dollars in running new, more efficient air conditioners and refrigerators. That is a good program, too.

Policy makers need to gather up these good programs and weave them together into a broad, long-range electric energy strategy. Looking to the 1990s, there are several factors which I believe will materially affect electric utilities.

Adequacy

Our first strategic policy goal should be adequacy of supply. Economic expansion in the 1980s was possible because of decisions made in the 1970s to expand electricity supply. Continued economic growth in the 1990s will raise electricity use an additional 25 to 40 percent by the turn of the century. Delays in adding new capacity, the retiring of aging plants, and peak demand growth could affect the ability to serve electricity customers in the very near future.

To ensure an adequate supply of electricity, energy efficiency—including conservation and load management—must be vigorously pursued. But efficiency gains will not be enough. Public policies must seek to remove the regulatory and financial obstacles that block utilities from locating, constructing, and operating environmentally safe baseload plants for the 1990s.

There must be greater certainty, greater predictability, and greater flexibility in the regulatory process. State regulators cannot continue to disallow recovery of sizeable investments in plants that were initially deemed essential.

It is disturbing that the industry's 1988 earnings-per-share were reduced by one-fourth due to the effect of plant disallowances. Thus, it is not surprising that new orders for large baseload plants that will be needed soon have not yet materialized, at least in part because of the regulatory and financial risks. If we are to meet growing customer demands, there is an urgent need for more candid understandings with regulators concerning plant cost recovery and returns on investments.

Flexibility

How best to meet the need, we all agree, should be left up to individual companies, because they are the ones that best understand the requirements of their customers. This brings me to another strategic policy goal: flexibility.

Forecasting future use admittedly contains an element of uncertainty. That is why our nation needs public policies that give electric companies the flexibility to meet future demand, whatever that demand should turn out to be.

Flexibility means allowing utilities to decide when they should build and when they should buy from others. Financial risk to electric customers is not necessarily lessened when utilities buy instead of build. A long-term contract for power supply can prove just as inflexible as a construction program if demand projections are altered or if plant cost recovery is in doubt.

I see a continuation of the trend toward increased competition in both the bulk power and retail markets. Cogenerators and independent power producers will play a larger role. The question is, how much of this energy can we count on and what will it cost to get it?

Utilities responded to oil and gas supply disruptions in the 1970s and early 1980s by constructing baseload coal and nuclear plants, and aggressively implementing energy efficiency strategies. As a result, the share of total electricity generated by oil and natural gas fell from 35 to 15 percent within 15 years.

John Zoner/Uniphoto

Public policies should encourage fuel flexibility. Too great a reliance on any single source could aggravate the nation's vulnerability to price increases and supply disruptions.

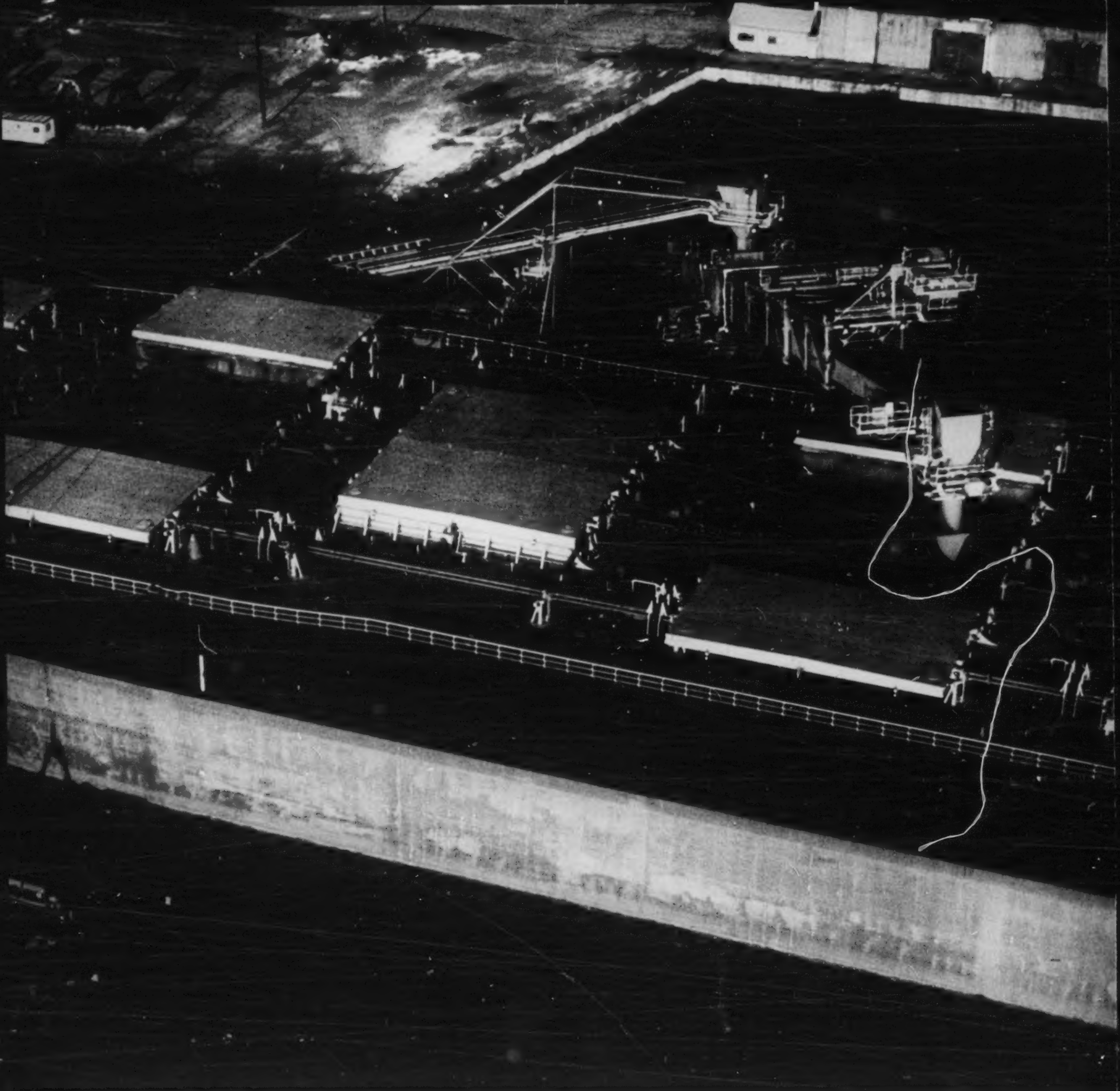
Unfortunately, over the next decade, almost one-fourth of new utility capacity, and a majority of nonutility generators, are expected to burn oil and natural gas. The lessons of the 1970s seem to have been lost. Industry leaders agree that current price levels for natural gas are inadequate to support increased exploration.

Therefore, the potential for higher gas prices should be weighed before encouraging more use of gas for electric generation. Nuclear and coal-fired stations, which have served us so well over the past two decades, should continue to be the most stable and secure energy sources for baseload generation.

Greg Pease/Folio, Inc.

Security

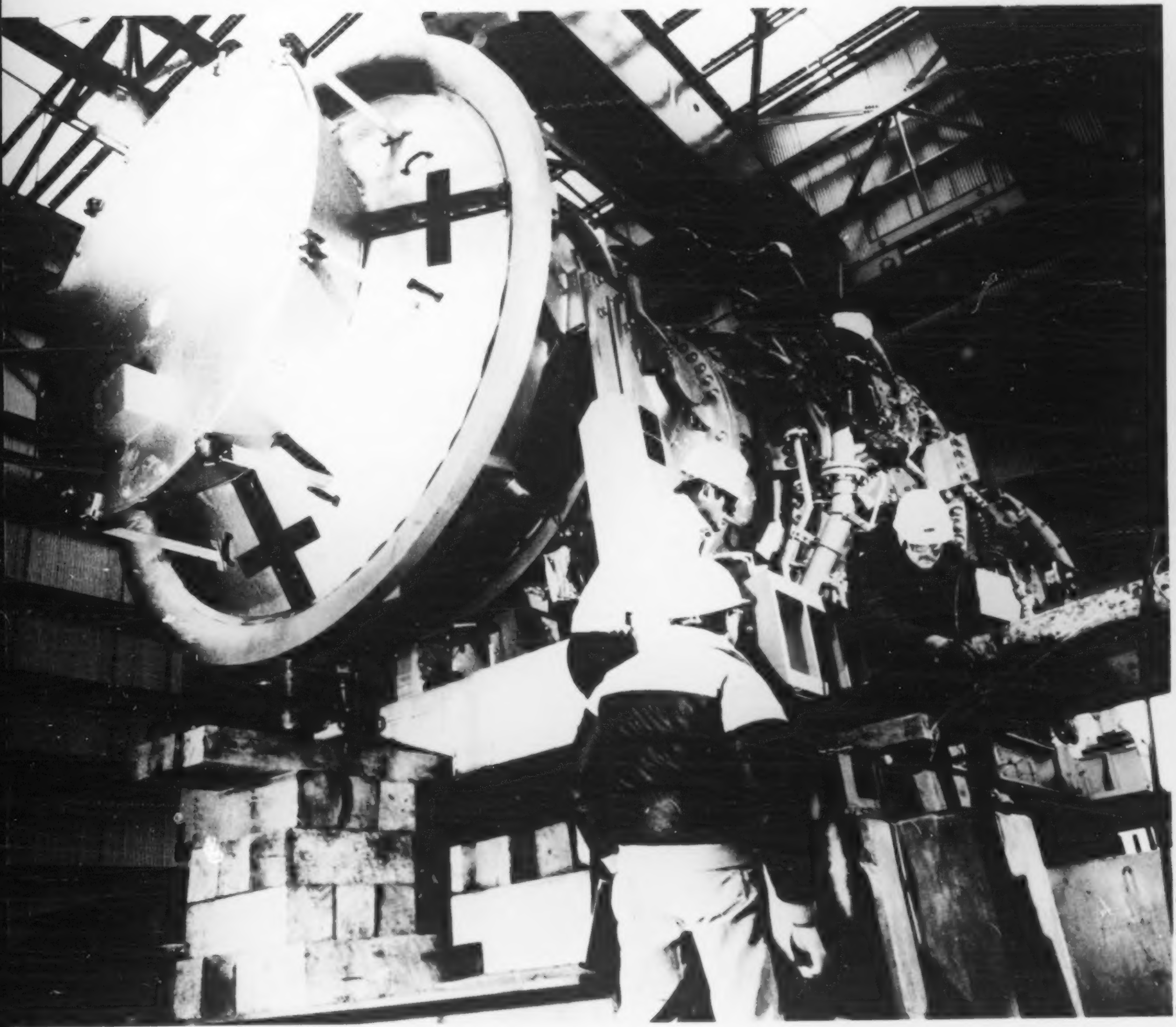
Maintaining secure supply of electricity should be another strategic



goal. The fact that no new nuclear plants and only a few new large coal plants are actively planned aggravates our vulnerability to foreign supply disruptions. The nation's most secure electric energy sources are the fuels within our own borders. Our nation would risk a form of paralysis if we were to retreat from our reliance on coal and nuclear energy. Yet, serious political, regulatory, and environmental impediments restrict the future contribution of these two domestic sources.

Unnecessary, restrictive regulations on power plant emissions could undermine utilities' efforts to tap America's immense coal reserves to meet future electricity needs. Fortunately, emerging clean coal technologies have the potential to both reduce emissions and boost efficiency. Public policy can address environmental concerns, while encouraging domestic sources. Increasing domestic electricity supplies and protecting the environment are not mutually exclusive choices.

Nuclear power has weathered intense public scrutiny and costly federal regulations. Despite these accomplishments, federal regulations, for too long, have been mired



GE Industrial and Power Systems

The near-term advantages of using gas turbines in combined cycle systems to meet growing peak loads must be balanced with the long-term need for additional baseload capacity.

in the apprehension of the past. Federal policy should help nuclear energy to continue to fulfill a primary role in the nation's electricity supply. Again, recent statements by the President, the Secretary of Energy, and others have provided encouragement. We pledge our full cooperation in helping to develop the specific policies to fully revive the nuclear option.

Reliability

A final broad electric policy goal must be service reliability. Providing reliable electric service requires that all the elements of the electric power system—generation, transmission, and distribution—work together at all times. The quality of our service—the precision of the 60 cycles of current that we deliver to customers—grows more important as the nation increases its dependence on new, highly-sensitive electro-technologies at home and at work.

Public policies must continue to foster voluntary utility system coordination and minimize the adverse impact of new suppliers on reliability. Utilities have proven their commitment to customer savings by using the nation's electric transmission networks to squeeze even more efficient use from existing bulk power supplies.

Although the transmission networks were not designed for electricity brokering, voluntary power exchanges among utilities help to ensure the efficient use of lower cost power. As a result, utility customers share an estimated savings of 15 to 20 billion dollars annually.

Electric utilities are considering every option to make their systems operate more efficiently without reducing reliability. Where cogenerators and independent power producers offer a viable option for utilities to achieve cost savings—and where they can be reliably integrated into electric power systems—the industry will turn to them.

But as competition and the number of new power producers increases, so, too, does the risk that reliability will suffer and costs will increase. We do not know how many non-utility generators can be reliably tied into our nation's power systems. Nor do we have a good understanding of either the costs or benefits of changing our current structure to increase competition. We do know that the high level of reliability that we now have in America's electric system is the envy of the world.

The Time Is Now

A national consensus finally seems to be forming that the time to address the issue of future electricity supply is now. Electric companies are implementing strategies to keep America growing well into the future, but we cannot do the job alone. And that is why we call on our colleagues at the federal and state levels to work with us in a new spirit of cooperation.

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Richard S. Tempchin and Jane M. Clemmensen

Transforming Power Quality Problems Into Marketing Opportunities

By helping customers meet their need for high quality power, utilities can position themselves as the preferred energy supplier.

Utility customers are continuing to use more and more sophisticated electronic equipment, resulting in a greater need for high quality electric service. By the turn of the century, over half of the nation's electric load will be fed through electronic equipment on the customer's side of the meter.

Eventually, all electric power may be electronically controlled. As Edison Electric Institute Vice President of Customer Services and Marketing Thomas D. Morron observes, "The issue of power quality can only grow more important—not only on the demand side but also on the supply side. The technical experts already foresee the day when our entire electric system, from point of generation to point of consumption, will be electronically controlled."

In fact, customers' need for high-technology electric equipment such as supercomputers, arc furnaces, and smart-house systems is already presenting electric utilities with new challenges and new opportunities. Variances in power quality that used to go unnoticed can now cause significant customer dissatisfaction. Consequently, a growing number of utilities are finding it necessary to assist their customers in solving power quality problems, even when the source of the problem is beyond the utility's control.

These utilities recognize that from the customer's point of view, service quality, power quality, and power system reliability are synonymous. It does not matter that traditionally utilities have considered the terms to be complementary yet distinguishable concepts. What matters in this increasingly competitive marketplace is the customer's perception of quality, which is a vital element of customer satisfaction. Satisfying customers' needs, in turn, is critical to the long-term profitability of the utility. And, as these needs change, utilities must develop flexible marketing strategies to provide the high quality of service that their customers demand.

Rising Expectations

Customers rarely consider the issue of power quality until something goes wrong. Most people take it for granted that utilities will provide a continuous, reliable energy source that will enable them to run their digital clocks, VCRs, computers, CAD/CAM work stations, and adjustable speed motor drives. And, in fact, this trust is seldom misplaced. Utilities spend more than $1 billion a year to maintain and upgrade their distribution systems to prevent power outages.

However, while it has always been important for electric companies to provide optimum service, the parameters of "optimum" have changed as customers' expectations have changed. Many customers are now judging their electricity supplier by more stringent standards than those of traditional utility operations-based reliability standards. In the manufacturing field, for example, businesses rely heavily on highly sophisticated and automated equipment. A momentary variation in power quality could cause production problems. A short power interruption can sometimes cost a business millions of dollars in productivity losses. To prevent downtime, customers look to the utility to ensure reliable and continuous service.

From the utility's perspective, it is often very difficult to meet these rising expectations. Many power quality problems originate at the customer's site or at a neighboring site. For instance, the source of the problem might lie in a poorly designed piece of equipment or in improper wiring.

Whatever the source of the disturbance, however, a utility must respond quickly and effectively to complaints or calls for assistance. By working closely with its customers to optimize their use of electric equipment, the company can earn customers' trust and confidence, positioning itself as the preferred energy supplier for the 1990s. Utilities that fail to be customer driven will lose their competitive edge.

Rick Tempchin is Manager of Demand-Side Management Information in the Customer Services and Marketing Division of Edison Electric Institute. Jane Clemmensen is President of Collective Intelligence, Inc., a Palo Alto, CA, software company whose specialties include power quality audit systems.

Today's sensitive electronic equipment presents utilities with new power quality [illegible]

Defining Power Quality

Power quality is a systems attribute involving not only the utility's power system but also the wiring, grounding, and load features at the customer's premises and any external source of power disturbances that may occur anywhere in between. How well the system performs depends on a number of variables along a seemingly infinite number of points in a highly complex and interconnected network. While the responsibility for maintaining power quality is perceived by many customers to rest on the shoulders of the utility, in actuality, the responsibility must be shared by the utility, the customer, and the manufacturers of electronic products.

Still, it is clearly in the best interest of the utilities to take the initiative and assess measures needed anywhere within the system to ensure optimum, reliable customer service. Moreover, of all the parties involved, electric utilities are perhaps best suited to helping end users identify, solve, and prevent power quality problems because utilities have traditionally approached challenges from a systems perspective. And, in fact, electric

John Keith / Folio, Inc.

Fewer than 20 percent of customers' power quality problems involve the utility's power system or external factors like lightening. Most disturbances originate on the customer's side of the meter.

Jim Olive / Uniphoto

Electronic equipment like computer-aided design systems and smart house systems will account for more than half of U.S. electricity use by the year 2000.

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utilities are working collectively now through the Electric Power Research Institute (EPRI) and the Power Electronics Applications Center (PEAC) to implement an end-use R&D plan that involves issues such as power monitoring, establishing specifications for power-conditioning equipment, and setting power requirement standards.

One of the goals of that effort is to define power quality terms so that electric companies, their customers, and equipment manufacturers can collaborate more effectively on solving and preventing power quality problems. Although the electric utility industry is making great strides in addressing power quality problems, it has not yet developed a "comprehensive definition of power quality because of the relatively recent emergence and proliferation of sensitive loads and the difficulty associated with quantifying the costs of poor power quality," explains Marek Samotyj, Senior Project Manager, Power Quality, EPRI.

According to Samotyj, there are several types of power disturbances that can occur along electric distribution lines:

- Power failures—long-term blackouts that last more than a few minutes, and short-term outages that last less than a few minutes
- Voltage sags and surges—short-term transient conditions and long-term steady-state voltage-regulation problems
- Waveform distortions—continuous, repetitive harmonic distortions and occasional glitches or notches in the waveform
- Flicker—repetitive sags and surges in the voltage, often accompanied by nonperiodic harmonic distortions
- Voltage spikes—high-voltage transients, usually induced by lightning
- Electrical noise—random, low-level static

However, over the past several years as the use of both microelectronic equipment and power elec-

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tronics has grown, the need for more precise definitions and technical standards has arisen. Microprocessors are contained in a wide variety of equipment—from home appliances to sophisticated industrial controls and, of course, computers. Power electronics are contained in computer power supplies and in other switching and control equipment. Microprocessors are often highly sensitive to slight power disturbances, and they do not always conform to historical power quality standards. In fact, although few people realize it, power electronics can be a source of power disturbances, and computers and other microelectronic equipment supplied by switching power supplies actually produce harmon-

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ics and noise. With new electronic equipment adding 124 billion kilowatt-hours per year by the 1990s, utilities across the country can be sure they will be hearing from their customers when problems occur.

Utilities' Response

Utilities are beginning to recognize the wisdom of confronting power quality issues head on. Quality will be key to winning customer loyalty, serving as a strategic tool for increasing utility revenues. As a matter of fact, 54 percent of the utilities participating in a 1988 Edison Electric Institute (EEI) survey have or are planning to implement power quality programs. Compared to earlier surveys by EEI and EPRI, that result indicates that interest in developing power quality programs is growing rapidly.

Recent experience also suggests that, to succeed, power quality programs must involve key staff from both marketing/customer services and engineering departments. Programs must be designed to achieve clearly stated marketing objectives, regardless of who has ultimate responsibility for the program.

In the past, such programs were usually limited to staff training, customer education, information dissemination, consultant and equipment supplier referrals, and infra- structure improvements. The

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programs being developed today are often more aggressive, reflecting the leadership role utilities are assuming in tackling power quality problems.

For example, in addition to the efforts being undertaken collectively through EPRI and PEAC, some utilities are working individually with trade allies—architects, builders, consulting engineers, electrical contractors, and equipment suppliers—to address power quality issues early on while new buildings are still in the design stage. It is much more cost beneficial to pre-wire a high-technology facility than it is to retrofit it later to accommodate increasingly sensitive equipment.

However, even the best design and retrofit plans are subject to interpretation by the installing contractor. Studies have shown that more than 80 percent of power quality problems occur within the customer's own facility and that the majority of these are electrical code violations that pose safety hazards as well as equipment performance problems. Hence, utility-sponsored seminars, contests, and demonstrations to keep electricians abreast of state-of-the-art applications are being employed in outreach programs that benefit utilities and their customers alike.

In fact, some utilities are also developing power quality programs involving direct customer contact. Activities include wiring and grounding surveys at customer sites, power monitoring and analysis, and recommendations for corrective actions. By giving the utility direct access to customers, contact programs also enable marketing representatives to promote a full line of demand-side management/marketing programs and to build a valuable customer database. In ad-

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Some utilities are working with builders and other trade allies to address power quality needs before new facilities are completed and expensive retrofits are required.

dition, close customer relationships can be used to gain insight into what the competition is doing.

Some utilities also directly lease or sell power conditioning equipment to their customers. However, with a few exceptions, utilities motivated to enter that business by the prospect of short-term profits have been disappointed. Many appear to have underestimated the level of effort required to sell such specialized products. But, on the positive side, these same utilities have been pleased with their success in achieving other marketing benefits through such programs.

In addition, a few utilities now offer innovative "premium" rates, which include provisions for special metering, multiple transformer banks, dual-feeds, and/or other measures designed to ensure power quality adequate to the tasks at hand.

The Competitive Edge

Utilities are discovering that marketing power quality programs can have several advantages. Such programs improve customer/service relationships and present the utility as a problem solver, increasing customer confidence. The specialized products and services delivered to customers as part of power quality programs add value to utility-provided electric service. That added value, in turn, can be a compelling reason for a customer to move into or remain in the utility's service area or to refrain from self-generating power.

Thus, in some instances, satisfying a customer's power quality needs may make the difference between a loyal customer and no customer at all. For example, one astute utility in the south central region recently initiated a power quality program primarily as a competitive response to a neighboring supplier's lower rates. In contrast, a large banking network in

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the Southeast recently solved its power quality problems on its own without its utility's input. The bank's data processing network is now powered by a cogeneration system that utilizes two 500-kilowatt gas-driven generators with a gas back-up generator. What happened here may indicate a dangerous trend toward fix-it-yourself solutions that by-pass utilities as customers attempt to secure the high quality power supply they need.

All in all, it makes good business sense for utilities to market power quality programs, especially to their industrial and commercial customers. Nationwide, power quality problems cost the manufacturing and service sectors billions of dollars a year, resulting in diminished productivity and product losses. By introducing power quality measures, utilities often help customers reduce costs and improve their competitive position in the marketplace. Moreover, the fastest growing manufacturing sectors from 1986 to 1995 are expected to be semiconductors, computing equipment, electronic components, electric measuring instruments, and communications.

As their electronics-dependent products and services penetrate more deeply and widely into other sectors of the economy, utilities must be prepared to offer the highest standards of power quality and service to those customers who will require and expect it. Failure to keep pace with state-of-the-art end-use technologies could result in a significant loss of market share, lack of public confidence, and a weakening of the nation's international economic competitiveness. Success, on the other hand, will require electric utilities to transform the challenge of emerging power quality problems into marketing opportunities, thus positioning themselves as the preferred energy supplier of the 1990s and beyond. It is a challenge they are already beginning to meet. ▰

This article is the third in an on-going series devoted to utility marketing issues. The first, "Utility Marketing Grows Up," appeared in the Winter 1988 issue. The second, "Consumer Perceptions about the Ground Source Heat Pump," appeared in the March-April 1989 issue.

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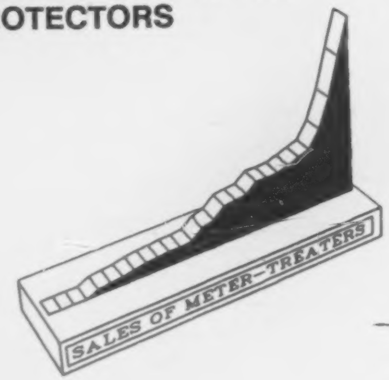

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Bernard W. Reznicek and Mary Anne Moorman

The Call to Lead: A Commentary

"Leaders must understand that the employer/employee relationship is the cornerstone of any sound strategic plan."

The call echoes in every corner of American industry: Leaders must lead. However, as has been the case for centuries, leadership is a simple term with complex meaning. What kind of leadership is needed to shape the future of American industry? What kind of relationship is needed between leaders and employees? What are the mission and tasks of the leader and in what priority should the tasks be executed?

While every industrial leader must give pragmatic answers to these compelling questions, nowhere are the questions more pressing and answers more decisive than in today's electric utility industry.

No longer are utility executives charged with maintaining the existing system. Now their mission is to shape the future of the industry. In response, they have mounted campaigns to reduce costs and to improve service to the customer, strategies designed to secure the survival of utilities against competitive threats.

As many leaders are discovering, however, the critical factor for success of these strategies lies not in the winds of change sweeping the electric utility industry, or in the decisions of politicians, or in the rules of regulators. It lies in the hands, hearts, and minds of utility employees. Consequently, to thrive in this era of renewed competition, a utility must be a premier employer as well as a high quality provider of energy services.

Leaders must understand that the employer/employee relationship is the cornerstone of any sound strategic plan. Only in partnership with employees can they simultaneously reduce costs and improve customer service.

The Changing Nature of Leadership: A Historical Perspective

Utilities have historically given America some of our most imaginative leaders. It is part of the industry's culture to tell tales of Tom Edison creating the incandescent bulb, or the giants in the Northwest who brought hydropower out of the wilderness, or the visionaries of the Northeast who united islands of power into today's electric giants.

From the 1930s to the 1960s, utilities provided the country with a breed of men who had the courage and stamina to build the most remarkable electrical system any nation had ever known. "Build and grow" was the strategy of the day. In typical Teddy Roosevelt Rough Rider style, utility leaders understood their demand-side charge and ordered action. Their efficiency was applauded by the public and their companies were given the nod of approval to continue to grow.

This operating environment led to highly structured organizations where everyone knew what they had to do and they did it. The rules were clear, and they were accepted and passed down, sometimes from father to son, in written and unwritten contracts.

The demand for utilities' services meant job security, and for many breadwinners this was the deciding factor in choosing to work for a utility. Employees believed they worked for the best that America had to offer.

Then in the late sixties the utility world changed. The so-called "Turbulent Years" began. The oil embargo hit and the economy of the country changed. The price of oil skyrocketed, and with it, the price of electricity. For the first time, customers complained about the cost of their electric bills. When customers complained, politicians listened and the media followed. Enter the era of political watchdogging and criticism.

Overnight, the acceptance of the post-war generation turned into anger. Baby boomers raised on Dr. Spock and Mr. Wizard entered the scene with questions, doubts, challenges to the status quo, and slings and arrows for America's utility leaders.

Among such throngs, Ralph Nader found a constituency no one guessed existed. This new group began looking at utilities from an environmental standpoint and the result was a whole series of environmental regulations.

In short, the "Rough Riders" charged directly into the wall of regulations and public controversy.

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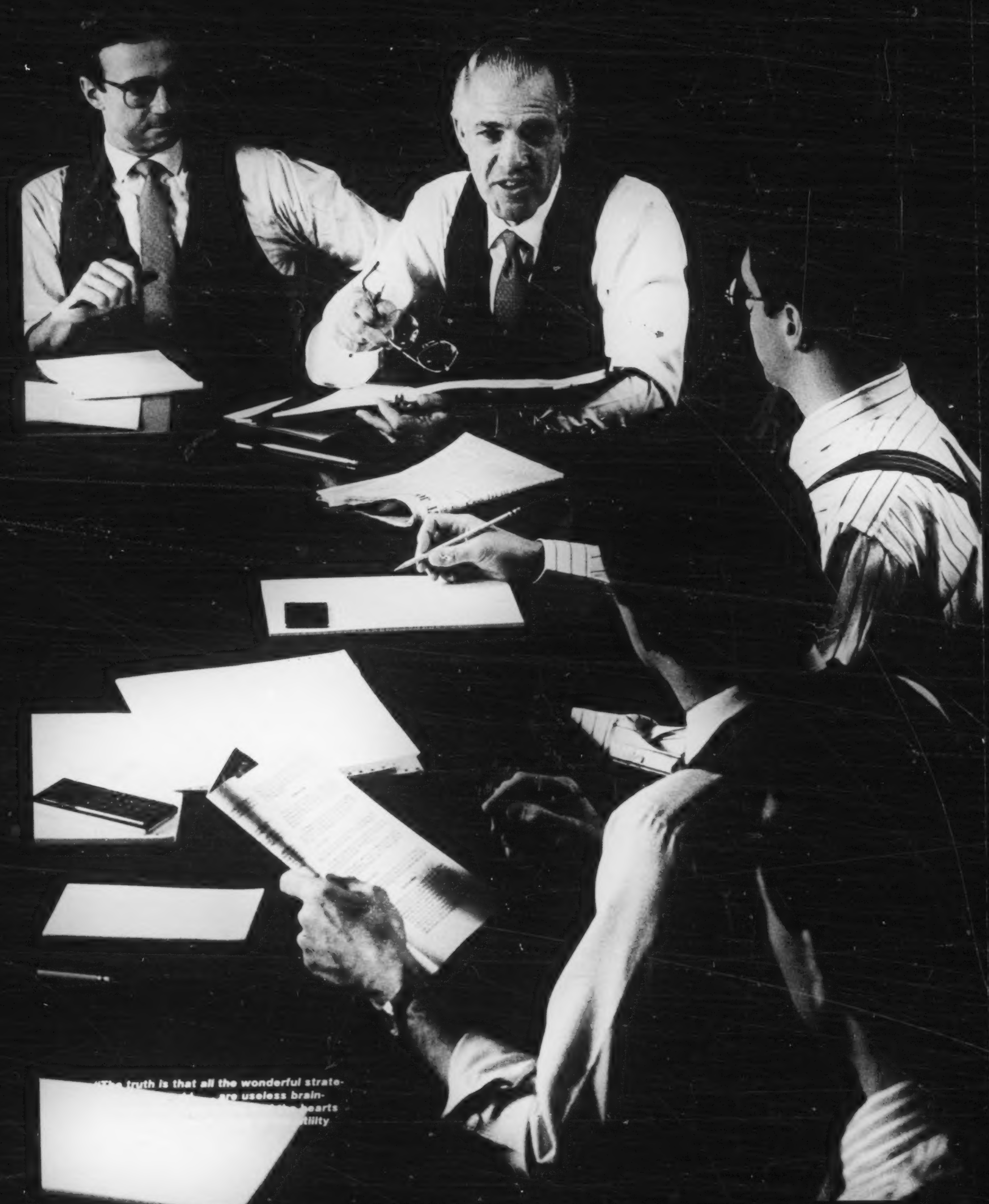
"The truth is that all the wonderful strate-
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Suddenly, they had to learn to waltz. Forecasting the future, getting along with regulators, and competitive pricing and positioning strategies became leadership challenges as utility executives learned to live with the fact that they no longer had the final say on many decisions.

The Broken Promise: Breakdown In the Employer/Employee Relationship

Meanwhile, as the executives focused all their attention on keeping the ship afloat, responding to citizens, politicians, and regulators, utility employees quit telling people where they worked. The questions and anger from critics gnawed at their self-esteem. No one seemed to appreciate a utility employee unless there was an emergency.

The once pioneering workers willing to sacrifice their lives for their jobs began to question the meaning of their work. Employees who chose to work for a utility because of the promise of job security, public respect, and self-esteem now faced job uncertainty, public scrutiny, and self-doubt.

Employees felt betrayed. A promise had been broken. They began to blame their own leaders for breaking the promise and perceived the changes in the industry as a failure of leadership.

As they lost their faith and trust in their leadership, they lost their belief that they worked for a premier employer.

The Leadership Challenge: Becoming A Premier Employer

The fundamental mission of utility leadership today is to repair the broken promise. Only a leader has the power to acknowledge a broken promise and replace it with a promise that can be kept. Only a leader can tell employees which of their dreams will become a reality and which, for now at least, must remain only as dreams and why.

In order to repair the broken promise and rebuild the industry's status as the premier employer, utility leaders must symbolize hope, renew trust, and cultivate participation among their employees.

Symbolizing Hope: Leaders are called upon to express the joys, expectations, and promises for the future. They arouse our emotions and kindle our spirit. They reduce our uncertainty and soothe our bewilderment. They provide a shared basis for understanding and for moving ahead. Leaders show us that the ideal of success lies within the capacity of human hands, hearts, and minds to deliver.

Outstanding leaders have always understood their role as symbols of hope. As such, they characterize the direction of an organization or nation, give hope for a better life to future generations, and assure us of the continuity of our institutions. George Washington symbolized the revolutionary hope of independence just as FDR symbolized the hope of a better tomorrow for a depressed nation.

No longer do utilities need only rationalists who prepare strategic plans and manage by objectives. Today, utilities also need leaders who are visionary, who make success attainable and human, who capture and preserve what makes the organization special, and who provide a lasting influence within the organization.

The charge is monumental, considering the fact that leaders today serve as a symbolic target for the lost dreams employees feel not only about their organizations but also about their nation. Consider this fact: The Department of Labor predicts the generation of Americans now entering the work force may look forward to lower real annual income than that of their parents. For the first time in American history we are not working for a better future: we are struggling to hold fast to what we currently have. In this way, the utility leader is sometimes even held responsible for the national condition.

The authoritative Teddy Roosevelt Rough Rider style of leadership so successful in the days of Henry Ford and Thomas Edison is not effective in today's operating environment.

Once utility leaders begin to understand the importance of their role as symbols for all that is good and bad in their organizations, and, perhaps, all that is good and bad in the nation, they can do what desperately needs to be done: offer hope.

What should utility leaders offer hope about? The survival and success of their organization. The power of the organization to control its own destiny. The capacity of each employee to contribute to the success of the organization.

The power of this message of hope cannot be underestimated. Research is beginning to document its importance to human survival in medical clinics throughout the world. And, whether in clinics or in electric utilities, the surest thing about symbolizing hope is that it creates a hero. Heroes, in turn, can spawn other heroes. Leaders who create an environment of hope will begin to find heroes in the boardroom and in the back room, at headquarters and in the field.

To be effective, of course, hope must be embodied in actions as well as in words. Consequently, as they acknowledge the broken promise of the past, leaders must ask employees for a measureable answer to the questions, "How will you know if I have kept my promise? How will you know things are getting better?" Then, when they achieve success, they should act it, tell it, print it, and celebrate it with all those who were a part of it.

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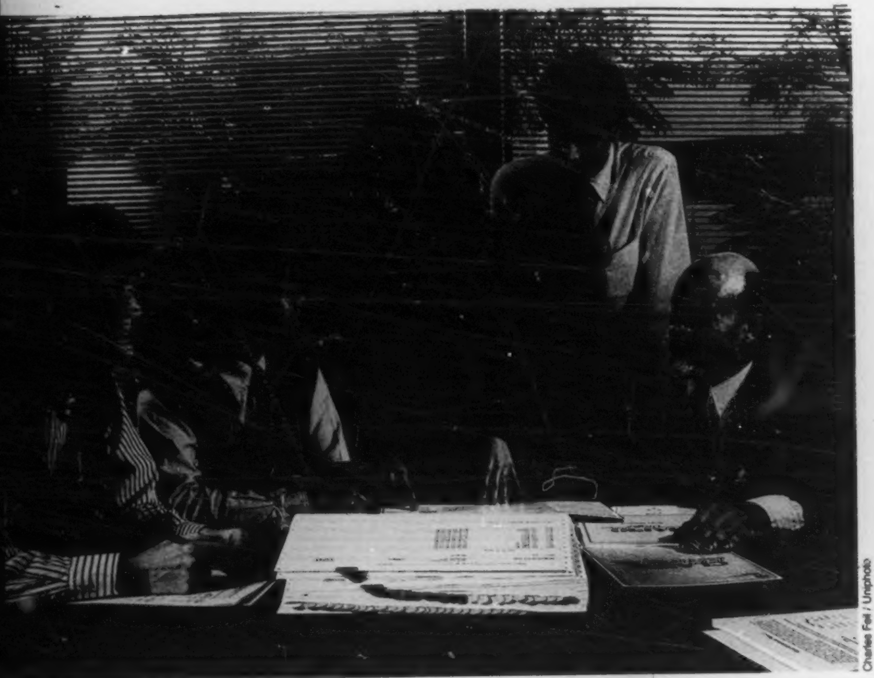
Renewing Trust: Someone once asked Bertrand Russell how to establish trust. He replied, "Try being trustworthy." It is crucially important that leaders recognize the time and effort it takes to reestablish trust. The commitment must be made. No relationship functions without trust, and this is certainly true for the relationship between employer and employee. Trust is essential to survival, and the executives who will lead utilities into the 21st century know it.

Employee perceptions are primary here. Their perceptions of trust are closely akin to their perceptions of fairness and consistency. Leaders gain trust by being fair and by saying the same thing in public as they do in private. How many negotiations have been lost when references to "the other conversation" were made?

Saying the same thing to all stakeholders has a remarkable impact on the work force. First comes disbelief, then comes skepticism that it will last, and, slowly, there is a great organizational sigh of relief. Mid-level managers, union representatives, front line employees all begin to believe what they hear.

Consistency tells people where the leader stands until they, themselves, can predict the leader's position. A certain degree of predictability is highly desirable in leaders mounting great campaigns of change: how can you rally around a loose cannon on a wobbly deck? Predictability builds trust in



Charles Feil / Uniphoto

employees so that, despite major change, they believe the helmsman is headed in the right direction and will not run aground.

Rebuilding and then maintaining this trust requires face-to-face communication. By meeting with employees in groups large and small, the utility executive reinforces to all levels of leadership within the company the value of its employees.

Of course, leaders have other valuable constituencies with whom trust is important also—regulators, the press, customers, shareholders, unions, suppliers, etc. But, although utility leaders must decide how to respond to and prioritize these constituencies, they must never lose sight of who is the most important of all: the employees who will implement and achieve their companies' strategies for corporate success.

Cultivating Participation: There is an art to transforming subordinates into willing collaborators. Exceptional leaders recognize the fact that followers are seldom so passive and leaders rarely so much in charge as one might think. Position on an organizational chart might earn one the designation "top management," but employees only bestow the title "leader" on those they choose to follow. The authoritative style of leadership where everyone knows the rules and the rules are made at the top was effective in the past, but no more. The exceptional utility leaders of the future will be those who disseminate decision-making throughout the ranks, who encourage employee initiative, who invite employee participation in addressing top issues, challenges, and problems, and who take this participation into top consideration before making final decisions.

"The exceptional utility leaders of the future will be those who disseminate decision making throughout the ranks. . . ."

As with building trust, cultivating effective employee participation requires time and patience. Some employees, particularly those accustomed to a heavily regimented decision-making process, may be convinced that nothing they say or do will make a difference. They may be uncomfortable when the rules change and feel that the company is out of control, that no one is in charge.

As leaders ask their managers to make better decisions, their supervisors to use better judgment, and their employees to think before they act, they must recognize that it is their job as a leader to create an environment in which rebuilding employee initiative is truly possible. Employees must be able to use their judgment without risking their jobs and to make meaningful contributions without being penalized for not doing their jobs. In fact, they should be honored for taking the initiative to make their organization a premier employer and high quality provider of energy services to customers.

Leadership is communicating the confidence that is necessary for good decision-making, empowering all leaders to use judgment along prescribed standards, and reaffirming that each human being has the power to impact his or her individual work day and, thus, the ultimate fate of the organization.

The truth is that all the wonderful strategies in the world—all the magnificent pricing schemes, load management policies, nuclear, thermal, or alternative generation technologies in the world—are useless brainstorms without the hands and the hearts and the magnificent minds of the utility work force.

Historically, utilities have given America some of our most imaginative and courageous leaders, and the time is ripe for it to happen again.

Reemergence of the Premier Employer

The call to lead reverberates throughout America. Utility executives are answering.

Those who will be on the top of the competitive heap in the 1990s will begin their strategies for success at home. Such premier employers will instruct the entire work force about the organization's direction and make sure that each individual employee is rewarded for contributing toward it. Great leaders make great teachers, as Thomas Jefferson was so fond of saying.

They will ensure that employees are treated with the same respect as customers, regulators, and politicians. Mutual respect could be the greatest competitive advantage any utility has.

They will repair the broken promises by replacing them with new promises and they will keep those promises.

They will rebuild by restoring employee faith as well as by improving customer service during the tumultuous times competition brings.

They will gain trust by being trustworthy and will elicit loyalty by being loyal.

They will restore utilities to a place of honor wherein all employees believe in the work they do, derive self-esteem and fulfillment by doing it, and take pride in their place of employment.

Where work is an honor, productivity increases. When work is enjoyable, the customer benefits. When the employees' contributions are reinforced and encouraged, it will become more popular to give to the organization than to take from it.

If utilities can reestablish this industry as a premier employer, perhaps it can become the new symbol for American business, and the utility executive, the new symbol of American leadership. ■

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FINANCIAL REVIEW

DOWNWARD TREND IN CONSTRUCTION SPENDING MAY BE COMING TO AN END

Investor-owned electric utilities project construction expenditures for electric plant, including allowance for funds used during construction, to total $72.2 billion during 1989–91 according to Edison Electric Institute's latest construction survey. As shown in Table 1, the three-year total is $426 million higher than that forecasted last year for the 1988–90 period and marks the first increase recorded since the annual survey was begun in 1982.

Table 1
Projected Construction Cost

Year of Survey	Forecast Period	Total Electric Plant Construction (Millions of Dollars)
1982	1982–84	$103,490
1983	1983–85	102,180
1984	1984–86	90,562
1985	1985–87	87,991
1986	1986–88	81,891
1987	1987–89	74,365
1988	1988–90	71,813
1989	1989–91	72,239

For the second year in a row, spending for the construction of transmission and distribution facilities over the forecast period is projected to exceed spending for the construction of electric generating plant. T&D's share of the construction budget has been steadily rising over recent years while generating plant's share has been steadily declining. (See Table 2.) During this period, many companies have completed large baseload construction programs and have begun upgrading and expanding transmission facilities to accommodate the additional capacity.

Table 2
Percentage Shares of Construction

Year of Survey	Forecast Period	Electric Generating Plant	Transmission And Distribution Facilities
1983	1983–85	70.0	22.2
1984	1984–86	64.4	29.8
1985	1985–87	54.0	32.7
1986	1986–88	48.8	36.0
1987	1987–89	43.5	40.2
1988	1988–90	40.5	41.3
1989	1989–91	38.9	45.9

Table 3 shows the breakdown of expenditures by year and by type. The data were tabulated from an industry-wide survey of 123 companies, which together represent 98 percent of the assets of the investor-owned electric utility industry. The companies applied on average a 5.2 percent annual rate of construction escalation, up from the 4.3 percent used last year.

Nuclear Generation

Nuclear expenditures, which peaked at $18.2 billion in 1983, were only $6.4 billion in 1988. The preliminary 1988 amount is the lowest amount of nuclear expenditures since 1976. Projections for 1989 through 1991 reveal a continuation of this declining annual trend.

In addition to the 102 nuclear units operating in the United States as of the end of 1987, six received commercial operating licenses in 1988. Another two units received full power licenses in March of 1989. There are five other nuclear unit generation projects active in the country, three of which are expected to be in commercial operation in late 1989 and early 1990. No new nuclear units are planned.

Coal Generation

The preliminary coal plant construction expenditures for 1988 are $3.9 billion, approximately the same amount as was forecast in last year's survey. During the forecast years of 1989 through 1991 the amount of coal construction expenditures is expected to gradually increase. Future construction costs related to coal generation projects were estimated to be an average of $4.0 billion a year for the 1988–1990 forecast period. The 1989–1991 forecast period shows that annual coal expenditures will increase to an average of $4.3 billion a year.

During 1988 the investor-owned utility industry did not put any new coal units into service. This year one unit has gone on line and three are projected to go on line later in the year. No coal units are projected for 1990, but during 1991 six units with a combined capability of 4,576 megawatts are scheduled to begin operation.

Table 3
1989 Survey of Investor-Owned Electric Utility Industry Estimated Construction Expenditures
(Millions of Dollars)

	Actual	Forecast			Summary of
	1988p	1989	1990	1991	1989–1991
Electric Generating Plant					
Nuclear	$ 6,404	$ 5,570	$ 3,294	$ 1,912	$10,777
Coal	3,936	4,195	4,340	4,497	13,032
All Other	926	1,271	1,400	1,652	4,323
Total Electric Generating Plant	$11,266	$11,036	$ 9,034	$ 8,061	$28,131
Transmission and Distribution Facilities					
Transmission Facilities	$ 2,059	$ 2,711	$ 2,973	$ 3,218	$ 8,902
Distribution Facilities	7,894	7,979	8,031	8,235	24,244
Total Transmission and Distribution Facilities	$ 9,953	$10,690	$11,004	$11,452	$33,146
General and Miscellaneous Plant	$ 1,759	$ 2,000	$ 1,938	$ 1,886	$ 5,824
Nuclear Fuel Expenditures	$ 1,723	$ 1,538	$ 1,732	$ 1,868	$ 5,138
Total Electric Utility Plant	$24,702	$25,265	$23,708	$23,267	$72,239
Amount of AFUDC in Total Electric Plant	$ 2,679	$ 2,602	$ 1,946	$ 1,295	$ 5,843

p - Preliminary Data

SOME COMPANIES TREAT THEIR CUSTOMERS BETTER THAN OTHERS.

The preliminary coal expenditure costs are not related solely to the construction of new coal plants. Costs associated with the repowering of existing plants and environmental control costs are included also.

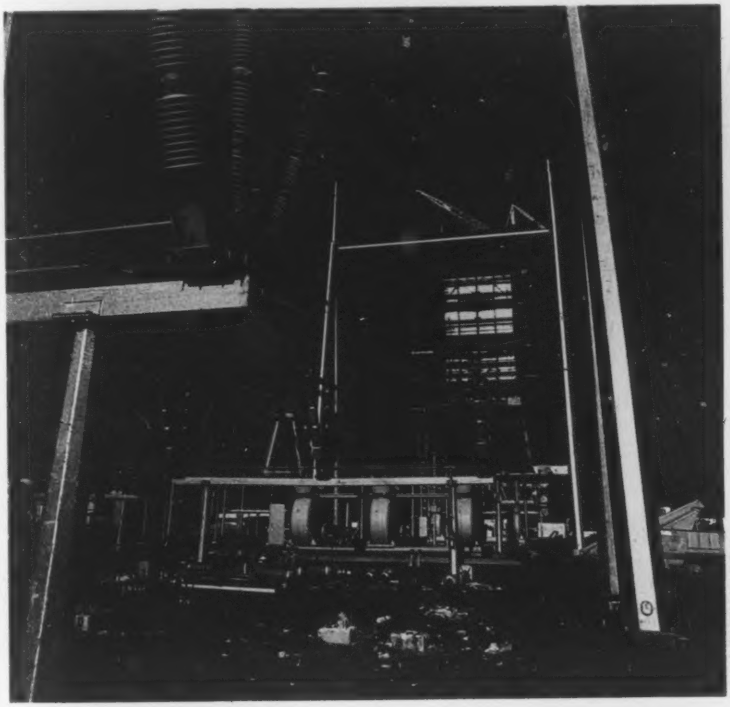
Other Electric Generating Plant

The preliminary 1988 estimate for other electric generating plant is $926 million, a 36.6 percent increase over the $678 million recorded in 1987. Over the 1989–1991 forecast period, annual expenditures on other electric generating plant average $1.4 billion. The increasing trend for other electric generating construction is expected to continue in the future, with the bulk of these expenditures being for the construction of combustion turbine plant.

Transmission And Distribution

The upward trend of expenditures for transmission and distribution facilities is expected to continue, with steady growth anticipated for transmission plant. The preliminary 1988 amount for transmission construction costs is $2.1 billion. The amount estimated to be spent on transmission facilities for 1989 is forecast to increase significantly to $2.7 billion. Almost 40 percent of the companies which participated in the survey forecast a 50 percent, or better, increase of 1989 transmission expenditures over the 1988 preliminary amount. During 1989–1991, estimated transmission construction expenditures average $3.0 billion a year.

Distribution expenditures for 1988 totaled $7.9 billion. Over 1988–1990, distribution expenditures averaged $7.4 billion a year. The average for the 1989–1991 forecast increased to $8.1 billion a year.



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AFUDC

The preliminary estimate for allowance for funds used during construction (AFUDC) for 1988 electric plant construction expenditures is $2.7 billion, a 41 percent decrease compared to the $4.6 billion recorded in 1987. This is the fifth consecutive year that AFUDC has declined since peaking at $7.9 billion in 1984. The survey results indicate that the trend will continue over the forecast period, during which AFUDC is estimated to average $1.9 billion a year. In 1987 AFUDC was 16.9 percent of total electric utility construction. By 1991 this figure is estimated to drop to 5.6 percent. The decline in AFUDC as a part of electric plant construction costs is due to more companies becoming involved in projects that do not have the long lead construction periods or higher dollar values of those in the past. Also, lower interest rates lead to lower AFUDC amounts. The trend of declining AFUDC means that the quality of earnings and cash flow for the industry will continue to improve.

Cash Flow And Other Results

Decreasing-to-flat plant expenditures coupled with decreasing AFUDC accruals will contribute to improving internal generation of cash for construction expenditures. Also, cash flow from operations is expected to continue increasing. The companies reported that the percentage of internal generation of funds for construction (compiled on an average basis unweighted) would be 77.3 percent in 1988, 82.6 percent in 1989, 87.8 percent in 1990, and 94.3 percent in 1991.

Contributed by Edison Electric Institute's Finance and Accounting Department.

TECHNOLOGY REVIEW

TARGETED CHLORINATION PROMISES MILLION DOLLAR SAVINGS

New England Power (NEP) of Westborough, MA, and the Electric Power Research Institute (EPRI) of Palo Alto, CA, have announced the results of a one and a half-year research study conducted to evaluate a new pro-environment technique called "Targeted Chlorination." The results of the study indicate that using this targeted chlorination technique at steam-driven electric power plants results in substantial energy savings, reduced chlorine use, and a positive impact to the environment.

"The targeted chlorination study revealed that the cleanliness of a power plant's condenser tubes can be increased by approximately 15 percent over conventional methods. The cleaner condenser tubes result in more efficient electricity production, which in turn helps to keep down the fuel charge component of our customers' bills," said George P. Sasdi, Senior Vice President and Chief Engineer for NEP's parent company, New England Electric.

"Furthermore, using this new targeted chlorination technique allows New England Power to reduce its chlorine usage by upwards of 80 percent, thereby lowering operating expenses. In addition, the lower chlorine usage results in nearly undetectable amounts of chlorine in the cooling water discharge, keeping the chlorine concentration well below the strict regulatory limit," Sasdi said.

The sea or fresh water used to cool condenser tubes in steam-driven electric power plants contains microbiological organisms and marine life, such as algae, that thrive in warm water. As the cooling water flows through the tubes, these organisms attach themselves to the warmer condenser tubes. This occurrence, called "biofouling," slows heat transfer and leads to decreased power plant efficiency.

Presently, most steam-driven plants use a technique called bulk chlorination to remove any microbiological organisms that may attach

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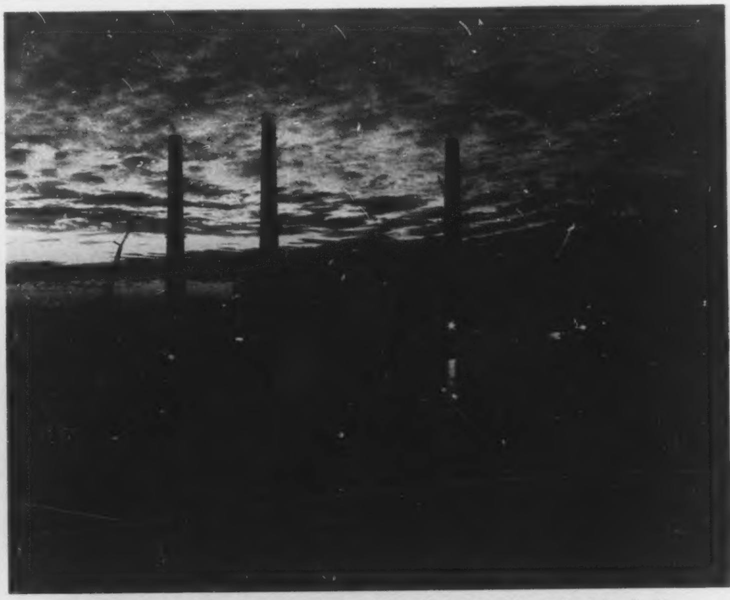

Robert D. Randolph / Uniphoto

The new technique for cleaning condenser tubes in steam-driven electric plants could save the industry up to $200 million annually.

themselves to condenser tubes. The bulk chlorination technique consists of applying large dosages of chlorine to cooling water. This process may drive discharge levels close to regulatory limits at times.

The targeted chlorination technique, which was developed by Stone & Webster Engineering, uses fixed-nozzles to inject pulses of relatively high concentrations of chlorine at selected condenser tube clusters for short time periods. The same concentration is applied sequentially to selected areas of the condenser tubesheet until all of the tubes have been treated.

"If you combine the savings from the increased efficiency of the generating unit and the reduced use and purchase of chlorine, EPRI has estimated that a utility can realize annual savings of between $200,000 to $300,000. In fact, with about 70 percent of the electric utilities in the nation using chlorine for biofouling, we have estimated that if they use targeted chlorination, the potential for cost savings to utilities nationally could reach $200 million annually," said Winston Chow, Senior Project Manager for EPRI.

It is estimated that New England Power will save approximately $200,000 per year from the installation of the new targeted chlorination equipment on Unit 2 at the company's Brayton Point Station. ▰

Contributed by New England Power's Information Services Department.

REGULATORY REVIEW

UTILITY INDUSTRY SUPPORTS CHANGES TO SIMPLIFY TAX CODE APPLICABLE TO EMPLOYEE HEALTH PLANS

The electric utility industry has endorsed House Ways and Means Committee Chairman Dan Rostenkowski's (D-IL) bill, H.R. 1864, which would amend Section 89 of the Internal Revenue Code to reduce the severe administrative burdens of complying with current law in implementing employee health and welfare benefit plans. H.R. 1864 will prevent penalizing plans where the same health care coverage is available to broad classes of employees and will significantly ease the burdens and the cost of compliance with present law.

The bill was introduced to address employers' concerns about the myriad of complex administrative and testing requirements imposed under Section 89 of the Internal Revenue Code applicable to health and welfare plans, which were effective January 1, 1989. Failure to pass these complex discrimination tests will result in all or part of the value of company-provided health and welfare benefits being taxable to certain employees.

Edison Electric Institute Senior Vice President Walker F. Nolan told the House Ways and Means Committee that H.R. 1864 is "superior legislation" that will result in "much fairer treatment of employees." Nolan explained that "most electric utilities have a health-care program that is available on a very broad basis, generally to all of their employees. . . . Because H.R. 1864 has a testing procedure that looks to availability for health-care benefits and not to the benefits elected or received by employees, its results will be both fair and appropriate."

According to Nolan, the industry "strongly supports the overall objectives and general intent of H.R. 1864," but suggested improvements to the legislation that would further its intent to simplify the current complicated, and sometimes unfair, regulations companies must comply with in implementing employee health care plans.

Electric utilities' most significant concern relates to the treatment of leased employees under H.R. 1864. Nolan explained that even though the bill "properly places the determination of whether a leased employee is eligible for a qualified core health plan at the leasing organization level, the provision also needs to provide a reasonable period of transition in order to be workable. By providing these transition rules, the bill will allow an adequate period of time to modify existing contractual arrangements and to implement the intended qualified core health plan contribution limits provided in the bill." In addition, Nolan suggested that the bill be amended so that the "safe harbor" for certain leased employees be modified to allow the exclusion of those employees if their leasing organization makes available affordable core health care benefits.

Mark Reinstein / Uniphoto

While Congress debates what to do about Section 89, the Treasury Department has delayed its implementation until October 1.

Nolan also explained that the "requirement to treat salary reduction amounts as employer-provided benefits only for highly-compensated employees is simply inequitable and distorts the amount of the actual employer-provided benefit." In addition, he said that "because the group of employees that are considered highly-compensated can include many employees covered under a collective bargaining agreement, this limitation can hurt the rank-and-file employees it was expressly designed to help."

Additionally, Nolan suggested that employers should be given the option to apply Section 89, either separately with respect to employees included in a qualified bargaining unit, or to the employer's entire workforce. "Both collectively bargained employees and employers would be better served if this provision were made elective," he explained.

Finally, Nolan said that while H.R. 1864 "properly recognizes the need to index the maximum employee contribution of $10 per week for employee-only coverage and $25 per week for family coverage," the use of a medical care index would be more appropriate. "Unless the permissible employee-paid component is indexed in this manner, the ability of employers to share the costs of these benefits with employees may gradually erode to a point where it is insignificant, a result inconsistent with basic overall health care cost principles," Nolan said. ▰

Contributed by Edison Electric Institute's Public Information Department.

STATISTICAL REVIEW

NON-UTILITY CAPACITY EXPANDS BY 19 PERCENT IN 1987

Non-utility producers are the fastest growing segment of electricity producers in the United States according to Edison Electric Institute's *1987 Capacity and Generation of Non-Utility Sources of Energy*. Their total installed capacity increased almost 19 percent from year-end 1986 to year-end 1987. In contrast, the total installed generating capacity of the electric utility industry grew by only 1.5 percent over that same year. (See Table 1.)

Of the 30,014.6 megawatts of non-utility capacity in place at December 31, 1987, cogenerators accounted for 74 percent and small power producers accounted for about 19 percent.

Qualified facilities (QF) represented almost 69 percent of the non-utility capacity in place at year-end 1987. Seventy-seven percent of the QF capacity was placed in operation after the implementation of the Public Utility Regulatory Policies Act of 1978.

Despite their rapid growth, however, non-utilities still accounted for only 4 percent of total U.S. generating capacity and only 5 percent of the U.S. electric supply in 1987. Moreover, energy received from non-utilities by the electric utility industry in 1987 equaled only 2 percent of the electricity available to the industry for distribution.

EEI surveyed 205 investor-owned electric operating companies and 143 publicly owned utilities to compile this third annual report on non-utility projects operating in the United States. By cross-checking data reported in other sources and by tele-

Table 1
Installed Generating Capacity in the United States by Type of Producer
(Megawatts)

At December 31	1987	1986	1985	1979
Total Electric Utility Industry[1]				
Investor-Owned Utilities	552,795.1	544,199.1	530,404.9	464,039.6
Government & Cooperatives[2]	165,260.5	163,485.3	158,328.6	134,258.1
Total	718,055.6	707,684.5	688,733.4	598,297.7
Non-Utility Producers				
Cogenerators				
Qualified	15,627.4	11,865.9	10,628.5	*
Not Qualified	5,574.3	4,992.0	4,949.2	*
Not Identified	1,108.4	1,589.8	1,492.4	*
Total	22,310.1	18,447.6	17,070.0	10,538.0 E
Small Power Producers				
Qualified	4,955.6	4,230.6	3,159.5	*
Not Qualified	809.5	653.7	615.1	*
Not Identified	14.6	68.9	65.0	*
Total	5,779.7	4,953.3	3,839.6	730.0 E
Other Non-Utility Producers	1,924.8	1,919.7	2,010.1	6,610.0 E
Total Non-Utility Producers	30,014.6	25,320.6	22,919.7	17,878.0 E
Total U.S. Capacity	748,070.2	733,005.0	711,653.2	616,175.7 E

SOURCE: Edison Electric Institute, *1987 Capacity and Generation of Non-Utility Sources of Energy*, publication number 04–89–04.

NOTE: Total may not equal sum of components due to independent rounding.

[1] U.S. Department of Energy. Energy Information Administration. *Monthly Power Plant Report* (EIA-759), *Annual Electric Generator Report* (EIA-860), and *Annual Electric Utility Report* (EIA-861).

[2] Government includes federal, state and municipal projects.

*Not applicable.

E = Estimated.

phone follow-ups, EEI received almost a 100 percent response from investor-owned companies and a 95 percent response from publicly owned utilities and electric cooperatives.

The 71-page report includes data on capacity and generation by year, type of producer and qualifying status; number and size of projects; electric utility receipts from non-utility producers; type of connection and dispatchability; prime mover; prime energy source; and major industry group. Many of the tables include state and regional breakdowns as well.

Contributed by Edison Electric Institute's Statistics Department.

Index to Advertisers

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Bechtel/KWU Alliance	6, 7
Cambridge Reports	15
Collective Intelligence	24
Consolidation Coal	Cover 4
Cresap Management Consultants	27
Dranetz Technologies	22, 23
Energy Management Associates	Cover 2
Haverfield Helicopters	3
Intertec Communications	24
Management Analysis Company	2
Meter Treater, Inc.	27
Nerco Coal Corporation	4
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Stockholder Systems, Inc.	Cover 3
Touche Ross	33
Westinghouse Electric Corporation	20, 21

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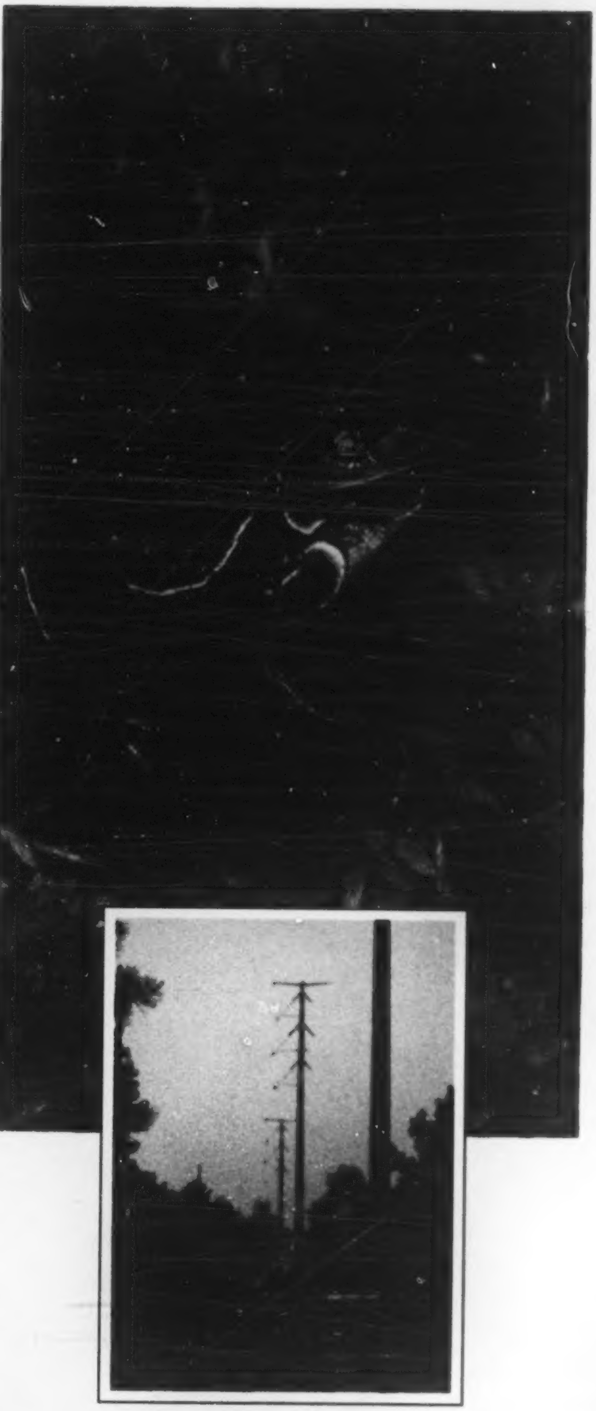

New Jersey Pine Barrens Tree Frog. Photo by Robert T. Zappalorti, Nature's Images

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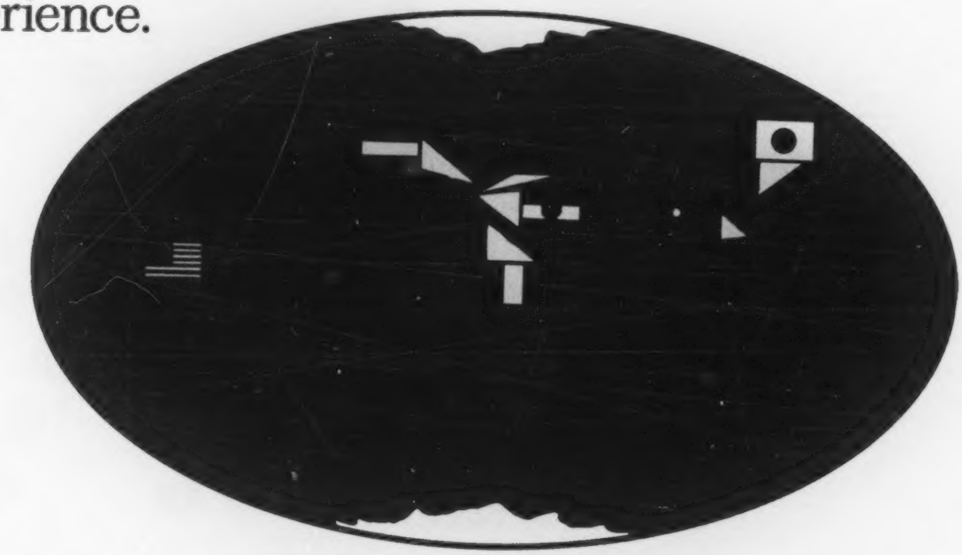

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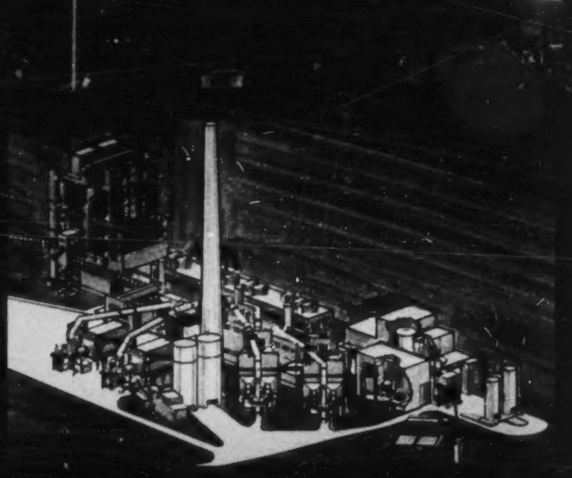

Proposed PFBC Repowering...
AEP Philip Sporn Plant, New Haven, West Virginia

As we enter the 1990's, utilities will face the challenge of satisfying the growing demand for electricity and protecting our environment. ASEA Babcock is ready to help you meet this challenge. PFBC Power Plants like Tidd, Värtan, Escatron and AEP's newest PFBC repowering project, Philip Sporn, will be coming on line, providing clean efficient electric generation.

This fall Värtan will begin operation followed by Tidd and Escatron in 1990. These plants will produce power more efficiently, with sulfur and nitrogen oxide emissions less than the standards now being considered by Congress. The operational experience gained will provide additional confirmation of the development and testing conducted at the Component Test Facility. We believe that PFBC power plants deserve your consideration when planning for repowering or new capacity.

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FOCUS 1990's

If you or other interested personnel in your company would like to schedule a presentation or discuss a project, please call Mr. Alan D. Jensen, Manager, Marketing and Sales, ASEA Babcock. Call (216) 334-2504 to make an appointment.

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in America's Investor-Owned
Electric Utilities

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CONTENTS

ELECTRIC PERSPECTIVES **SEPTEMBER–OCTOBER 1989**

A LOWER COST APPROACH TO CLEAN AIR 8

Given greater flexibility to meet the bill's clean air goals, utilities could reduce H.R. 3030's $4.5–5.5 billion price tag by 20–30 percent.

By David L. Swanson and Robert A. Beck

GAINING THE COMPETITIVE EDGE THROUGH SUPERIOR CUSTOMER SERVICE 18

Understanding customer perceptions and attitudes can help utilities create a "clear value" proposition that advances the benefits of electricity over its alternatives.

By Gene Pokorny and James Murphy

UTILITY LAND MANAGEMENT 28

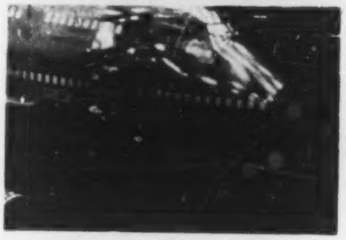
For many electric utilities today, land management is an important and specialized function.

By Stan Benjamin

INNOVATIVE RATES AND THE JUST AND REASONABLE STANDARD 40

As growing competition shifts utilities from "price makers" to "price takers," new regulatory criteria are emerging for evaluating the justness and reasonableness of innovative rates.

By Eric Ackerman and Russell J. Profozich



REVIEWS

FINANCIAL REVIEW 47

TECHNOLOGY REVIEW 52

REGULATORY REVIEW 53

STATISTICAL REVIEW 56

Cover photo by Frederick Stork/Folio, Inc.

THE CLEAN COAL TECHNOLOGY BY THE YEAR 2000

The President's recent Clean Air Proposals place a heavy emphasis on the role clean coal technology will play in our future. But you don't have to wait until the future before proven technology is developed, refined and available for your use.

Texaco's Coal Gasification Process can give it to you now because we've already done our homework. We anticipated the importance of coal in America's future way back in 1948. And we've been improving our technology ever since.

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•An abundant fuel source. 240-billion tons of coal are estimated in the U.S. alone…representing over

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250 years supply at the current rate of consumption.

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- Responsiveness to changing energy demands. A technology that lends itself to modular construction and provides feedstock flexibility—an operator can alternate between oil, gas, or coal, dependent upon site-specific economics.
- Clean and commercially marketable by-products. The essentially pure sulfur and non-hazardous coal ash (slag) produced by coal gasification have commercial value.
- Full assistance from Texaco. The Texaco Development Corporation offers guaranteed coal gasification technology, comprehensive technical assistance and operator training.

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COAL GASIFICATION

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David L. Swanson and Robert A. Beck

A Lower Cost Approach to Clean Air

Given greater flexibility to meet the bill's clean air goals, utilities could reduce H.R. 3030's $4.5–5.5 billion price tag by 20–30 percent.

Congress will soon consider what could be the most significant environmental legislation for electric utilities in decades—the renewal of the Clean Air Act. President Bush released his Clean Air Act amendments on July 21. They were introduced into the House of Representatives on July 28 by Congressmen John Dingell (D-MI) and Norman Lent (R-NY) as H.R. 3030. [Companion legislation was introduced into the Senate by Senator John Chafee (R-RI) as S. 1490.] Congressional committees will work on this proposal throughout the fall. Proponents of this legislation expect to have a bill on the President's desk before the end of the second session next year. If significant changes are not made in the current proposals, utilities will be hamstrung with ineffective and expensive requirements that will hinder, not help, their efforts to continue cutting their air emissions. And utility customers across the country will be stuck with additional costs of $4.5–5.5 billion each year to reach goals that could be met through more efficient means. Moreover, these costs cover only the acid rain control portion of the bill. Additional costs will be incurred as well.

The President's sweeping proposal maps out a strategy for reducing the amount of material released into the air by virtually every sector of society, from personal automobiles to large industries, including electric utilities. Its intent is laudable, but its effect will be to put an unreasonable and unnecessary tax on future growth. Electric utilities are proud of the progress they have made since the passage of the 1970 Clean Air Act. Altogether, since 1973 American industry has reduced sulfur dioxide emissions by more than 8 million tons. Industry is currently spending $43.8 billion annually on air pollution control, according to the Department of Commerce. In the electric utility industry, we continue our commitment to do our part to help the nation meet its clean air goals.

But we do have some serious reservations about the timing of H.R. 3030 and some of its specific provisions. With the final results of the National Acid Precipitation Assessment Program (NAPAP) due out until next year, we feel that the President's call for a further 10 million ton reduction in sulfur dioxide emissions is premature. NAPAP will provide a solid scientific foundation for recommending additional emissions reductions if they are needed. Legislation as potentially expensive as this needs such a foundation.

In addition, some of the provisions designed to ensure that these reductions are realized are unworkable and counterproductive. They would greatly increase the costs of the electric utilities' continuing pollution control programs, while lowering their efficiency and creating major inequities and disproportionate costs among individual utilities.

H.R. 3030

In the guidelines he released in June, President Bush endorsed the concept of giving utilities maximum flexibility to achieve any required reductions in order to lower the enormous costs to electric customers and maximize efficiency. As part of accomplishing this goal, he pledged to make his program as "market-based" as possible. The proposed legislation, however, creates major stumbling blocks to its own success.

- It sets caps not only on emission rates, but also on total emissions by failing to recognize inevitable variations from utility to utility, and from year to year in individual utility operations.
- It proposes a market-based trading arrangement to give utilities flexibility in meeting requirements, but sets unrealistic schedules and restrictive controls that are disincentives for utilities to participate.
- It sets rigid and arbitrary baseline dates for measuring compliance that create major inequities among individual utilities, leaving some utilities at a major competitive disadvantage in a time of rapidly expanding competition.
- It sets unrealistic deadlines that will impede utilities from making informed choices about the use of clean coal technologies for future capacity additions.

David Swanson is Edison Electric Institute's Senior Vice President for Energy and Environment. Robert Beck is the Institute's Director of Clean Air, Fossil Fuels and Natural Resources.

Everett C. Johnson/Folio, Inc

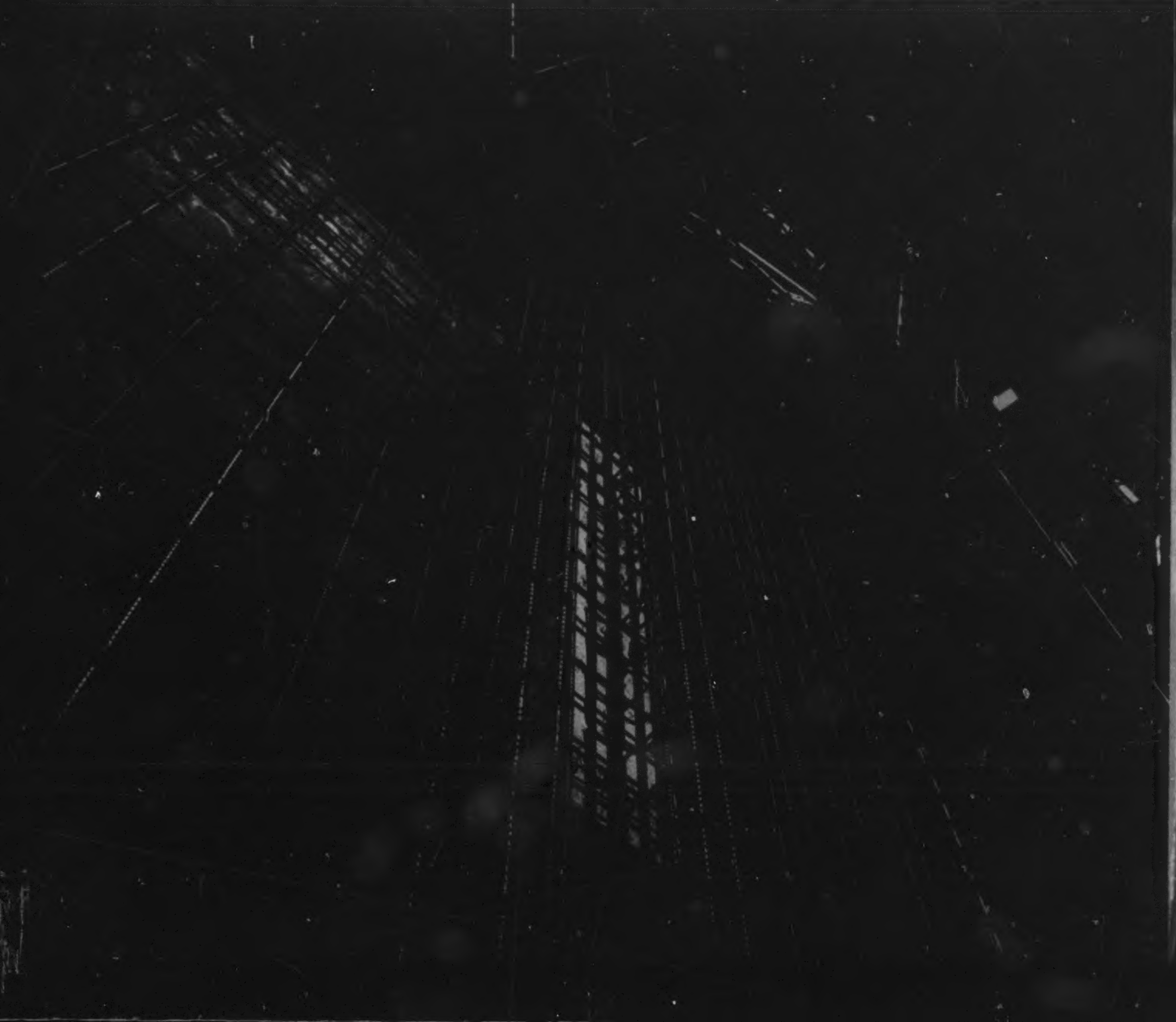
The objective of the electric utility industry is to help achieve our nation's clean air goals in a way that assures an adequate, reliable, and economic power supply, protects the environment, and promotes economic growth.

- It gives the Environmental Protection Agency (EPA) broad discretionary power to interfere in individual utility operations, allows EPA to infringe on states' authority to control permits within their borders, and gives EPA almost unlimited emergency powers while insulating it from judicial review of its actions.

According to an analysis by economic consultants Temple, Barker and Sloane, Inc., these provisions will add from $4.5-5.5 billion a year to electric customers' utility bills over 20 years, for a total cost of $90-110 billion. The same emission reductions called for in H.R. 3030 can be achieved more economically by other means. If utilities are given the flexibility to make their own decisions on how to meet the emission reduction requirements, a 20-30 percent savings can be achieved. Clean coal technologies should be an important option in meeting emission reduction requirements. However, although H.R. 3030 proposes a clean coal incentive program, the bill is structured so that it will actually work as a disincentive to utilities struggling to meet the new requirements. This ultimately could mean writing off coal for new generating capacity.

Commercial and industrial growth will become even more reliant on electricity over the next decades. Consequently, it is vitally important to our nation's international competitiveness that electric utilities have maximum flexibility to reduce emissions by lower cost means than those proposed in H.R. 3030.

Bob Daemmrich/Uniphoto



This would be particularly disastrous for the growth of our economy given its dependence on an adequate electricity supply. The close connection between electricity use and real Gross National Product growth rates, so evident since the mid-1970s, is expected to continue through the rest of this century. Over the next decades, commercial and industrial growth will become even more reliant on electricity, as will the quality of our personal lives. The cost of energy, particularly of electricity, will continue to affect the competitiveness of our manufactured goods in the global marketplace, which more and more is a key determinant of our overall economic health.

The 20-year levelized cost of complying with H.R. 3030's acid rain control program varies tremendously from region to region. Fifteen states clustered in the Eastern United States bear the brunt of complying with the proposed legislation. Together they would foot about 85 percent of the $4.5-5.5 billion annual bill.

However, beyond the year 2000, as electric utilities across the country bring new coal-fired plants on line to meet growing electricity demand, all states, most particularly those in the West, would experience significant additional costs to meet the offset requirements proposed for new sources. These extra costs could add $900 million to total annual costs after the year 2000.

The listing here does not include the cost of meeting these offset requirements. It represents expenditures (in 1989$) made between now and the year 2000 to meet the requirements of all the other provisions of H.R. 3030. Costs are averaged over each state and levelized over 20 years. Rate increases include adjustments for major wholesale purchases of power from other states.

State	Compliance	% Rate Increase
Alabama	$177-$216	4.4- 5.4
Arizona	3- 3	0.1- 0.1
Arkansas	1- 1	0.0- 0.0
California	0- 0	0.0- 0.0
Colorado	4- 4	0.2- 0.2
Connecticut	2- 2	0.1- 0.1
DC	0- 0	2.3- 3.4
Delaware	19- 17	3.1- 2.8
Florida	108- 172	2.0- 3.1
Georgia	221- 318	5.0- 7.2
Idaho	0- 0	0.5- 0.6
Illinois	292- 333	4.3- 4.9
Indiana	522- 533	12.4-12.7
Iowa	38- 42	2.6- 2.8
Kansas	8- 13	0.5- 0.8
Kentucky	176- 253	6.4- 9.1
Louisiana	1- 1	1.9- 2.4
Maine	1- 1	0.3- 0.4
Maryland	93- 103	5.0- 5.5
Massachusetts	38- 67	1.2- 2.0
Michigan	90- 105	2.1- 2.4
Minnesota	30- 33	2.3- 2.5
Mississippi	22- 34	3.9- 5.7
Missouri	264- 336	8.9-11.3
Montana	4- 4	0.7- 0.7
Nebraska	2- 2	0.2- 0.2
New Hampshire	24- 29	4.4- 5.4
New Jersey	53- 55	3.5- 3.9
New Mexico	3- 3	0.2- 0.2
New York	100- 128	1.3- 1.7
Nevada	2- 2	0.2- 0.2
North Carolina	135- 180	3.3- 4.4
North Dakota	28- 29	2.4- 2.5
Ohio	688- 798	11.0-12.7
Oklahoma	1- 1	0.1- 0.1
Oregon	0- 0	0.0- 0.0
Pennsylvania	487- 572	5.8- 6.8
Rhode Island	0- 0	1.4- 2.4
South Carolina	81- 110	3.8- 5.2
South Dakota	23- 26	5.4- 5.9
Tennessee	196- 324	6.4-10.2
Texas	17- 18	0.1- 0.1
Utah	1- 1	0.1- 0.1
Vermont	0- 0	0.0- 0.0
Virginia	54- 81	4.5- 5.6
Washington	56- 56	2.1- 2.1
West Virginia	334- 367	9.7-10.6
Wisconsin	60- 100	2.7- 4.5
Wyoming	20- 22	1.4- 1.6

• • • • • • • • • • • •

Struggling to satisfy a variety of masters, utilities have to make the best use of all available resources. Since coal is our most abundant domestic energy option, we cannot afford to write it off or to unduly restrict its expanded use, as H.R. 3030 has the very real potential to do. In cooperative research and development programs with the federal government, we are addressing environmental concerns. The effort cannot be short-circuited.

A Lower Cost Approach

The key to a cost effective air pollution control policy is flexibility. While the bill focuses, as it should, on clean air, it fails to recognize the serious implications such overly restrictive and inequitable regulations can have on individual companies and their customers and on other pressing national and regional concerns. The objective of the electric utility industry is to help achieve our nation's clean air goals in a way that assures an adequate, reliable, and economic electric power supply, protects the environment, and promotes economic growth. In order to lower potentially enormous costs to consumers and minimize adverse economic and energy impacts, it is vitally important that electric utilities have maximum flexibility to use the least-cost means available to achieve additional emission reductions.

If utilities are to achieve the goal of least-cost emission reductions, certain specific provisions in H.R. 3030 must be modified. Following is a discussion of five of the major provisions and how they can be improved.

Emissions Caps: In his original Statement of Principles on clean air released in June, the President stated that all plants above a certain size should "meet the same emission standard," which would ultimately be set at about 1.2 lbs/mmBTU in the second phase of the program for sulfur dioxide (SO2) emissions. This limit was chosen to result in an overall reduction in SO2 emissions of approximately ten million tons from 1980 emissions levels, and the year 1985 was chosen as a base year for determining applicable emissions levels at all units. As the base year changes from 1980 to 1985 in the proposed legislation, however, it unfairly discriminates against some plants with traditionally lower emissions rates.

For example, for plants operating prior to 1985 and with emissions rates greater than 1.2 lbs/mmBTU, the bill determines a "cap" on total allowable emissions based on average heat input in fuel from 1985 to 1987. If a unit were operating below the 1.2 lbs/mmBTU standard in 1985, its future allowable emissions would be frozen at the 1985 figure rather than the standard total allowed to other units of similar size. This unfairly penalizes these units for emitting at a very low rate for 1985 by permanently reducing the allowable emissions totals. This violates the "same emission standard" proposed in the President's June Statement of Principles. A similar limitation applies to emission totals on an annual basis. The electric utility industry opposes any cap on annual emissions and recommends that the historical method of emission rates be used. This rate should be set at not less than 1.2 lbs/mm BTU.

For example, for plants operating prior to 1985 and with emission rates greater than 1.2 lbs/mmBTU, the bill determines a "cap" on total allowable emissions based on average heat input in fuel from 1985 to 1987. If a unit were operating below the 1.2 lbs/mmBTU standard in 1985, its future allowable emissions would be frozen at the 1985 figure rather than the standard total allowed to other units of similar size. This unfairly penalizes these units for emitting at a very low rate for 1985 by permanently reducing the allowable emission totals. This violates the "same emission standard" proposed in the President's June Statement of Principles.

These inequities are created in large part by the bill's provisions for the choice of the base year. The arbitrary selection of the same base year for all units introduces major inequities between sources and groups of sources due to complex operating factors in different systems. Performance in any one year can be anomalous, either for good or bad, and have little relationship to actual performance over the unit's lifetime. Fuel quality, for example, can vary greatly from purchase to purchase. The arbitrary choice of a single year fails to account for these differences and has the further potential to reward plants with inferior histories while penalizing those which have already lowered emissions. This system reduces what should be the careful choice of standards to little more than a lottery.

To provide flexibility and equity in total annual emissions, utilities should be given a choice of base year. They should be allowed to choose either 1980 or 1985, or an average of any consecutive three-year period during 1980-87. To allow for equity in setting emission rates for units, the EPA Administrator should be given the power to set a higher emission limit for units with special circumstances.

New Unit Offsets: H.R. 3030 requires all SO2 emissions from new plants to be offset by reductions in

emissions from existing plants. This will be extremely punitive to the companies who currently operate the cleanest plants, primarily in the Western half of the country. These companies will have trouble reducing their already low levels of emissions. They may also have trouble purchasing permits from the East, where demand growth is highest.

The new unit offset provisions of the proposed bill apparently anticipate significant growth in emissions from new units. However, these units will be governed by increasingly tight standards under the New Source Performance Standards and Prevention of Significant Deterioration provisions of the existing Act. There is little justification in requiring offsets for a class of sources that will be extremely clean, especially when those requirements will result in a severe tax on growth for large parts of the country.

Emissions Trading: Trading emissions is one of the most innovative features of the proposed bill, if allowed to function as originally conceived. The Administration originally asked industry to come up with criteria for a system of trading emission permits and credits among plants and utilities. Some environmental groups supported this concept. The utilities suggested a market-based system in which emitters, as well as third parties, are able to buy, lease, or trade emission permits and credits as freely as possible, without overtaxing the regulatory structure.

Trading emissions credits through a flexible permit system has the potential to save billions of dollars over traditional stack-by-stack compliance, with equal or better environmental results. Utilities could build

Since clean coal technologies have the greatest potential for yielding sustainable emission reductions, legislation should encourage, not hinder, their development and commercialization.

Robert Rathe/Folio, Inc.

Uniphoto

up credits if they reduced emissions below the levels set in the bill. Meeting the standards early would also generate credits. These credits could be purchased on a free and open market by utilities that could not efficiently meet standards in time, or ran into difficulties with weather, fuel supply, and other local conditions.

The net result would be the regional and national emission reductions envisioned by the law, but at a savings of billions of dollars. It might result in even greater reductions. An orderly emissions credit market would considerably increase the options available to utilities to comply in the most cost-effective manner.

An orderly market system would also generate economic pressures for rapid development of clean coal technologies, without favoring one technology or group of technologies. Emerging technologies would have, economically speaking, a "level playing field."

Equally important, a well-designed market would not overtax our regulatory systems with endless reviews and documentation. The issue would not be fought on a plant-by-plant basis, but solved on a system-wide basis in a flexible and market-driven manner.

Although such trading is sound in concept, the bill in its present form raises so many obstacles to orderly trading that all these benefits will be essentially eliminated. The bill would require utilities to identify all trades ahead of time in a compliance plan based on a five-year permit program, even though the capacity factors and tons emitted from individual units will vary every year depending on economic conditions, weather, the physical condition of generating units, and other operational situations.

Enabling individual utilities and others to trade emissions credits in a free and open market has the potential to save billions of dollars over traditional stack-by-stack compliance, with equal or better environmental results.

Any additional trades would require amendment to the plan, with all the regulatory red tape of the permit authorities. To further complicate trades, the five-year life of the proposed permits limits trading to the short term only.

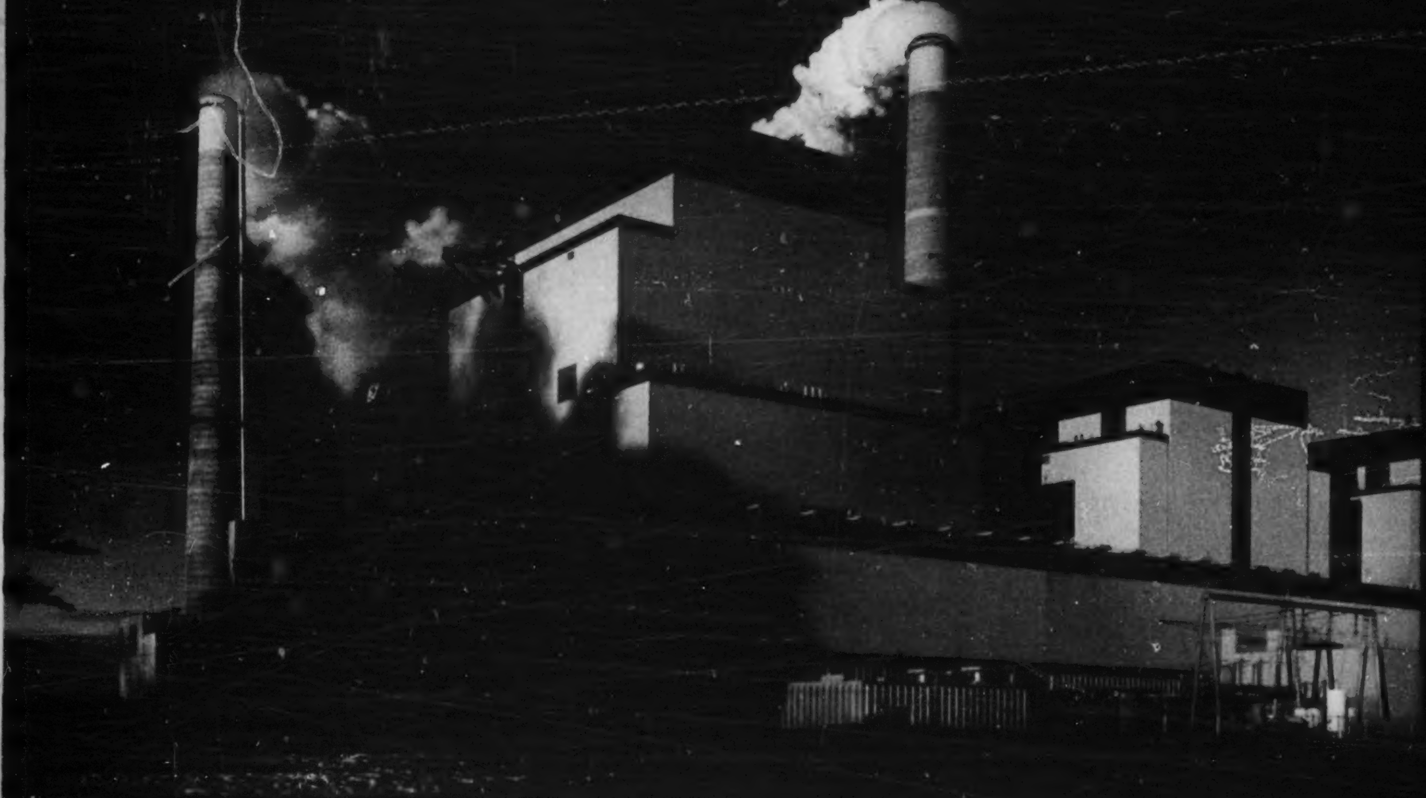
Under the proposed legislation, even trades outlined in a compliance plan would be very difficult to transact. They would not be self-executing like stock and bond trades, but would have to be approved through the permit system by the EPA Administrator. State approval would also be necessary.

Pricing would also be a problem, since only the owners of emission sources would be entitled to own credits and allowances. Third parties could not enter the market, and the ability to bring buyers and sellers together would be severely restricted.

Finally, since the bill does not specify leasing of permits, industry must assume that EPA will not allow leasing. This will eliminate the vast majority of potential trades. Most utilities will be reluctant to sell their allowances permanently, due to uncertainty in electricity demand. However, they would be interested in leasing them for fixed periods.

In summary, H.R. 3030 would create a trading system that subjects transactions to lengthy and cumbersome review, prohibits secondary markets, and gives utilities no incentive for early compliance. This is not to anyone's advantage. To make emissions trading work, allowances will have to be established as easily transferrable and time-limited commodities, like leases are for office buildings, not the subject of wasteful and unproductive regulatory proceedings.

Sherco 3



Jointly Owned Unit Saves Money for Utilities

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In addition to those front-end cost savings, the 855 net MW coal-fired unit has operated at 97.9% availability since it started commercial operation November 1, 1987.

The newest unit at the Becker, Minnesota site is owned by Northern States Power Company (59%) and the 18 members of Southern Minnesota Municipal Power Agency (41%). Direct costs were $664 per net kW.

NSP was project manager for Sherco 3. This unit joins the two 700 net MW units that are totally owned by NSP and went on line in 1976 and 1977.

Black & Veatch designed all three Sherco units. Engineers responsible for the work on Sherco 3 include Gary Gunn (r.), partner and project manager, and Paul Bockelman, engineering manager.

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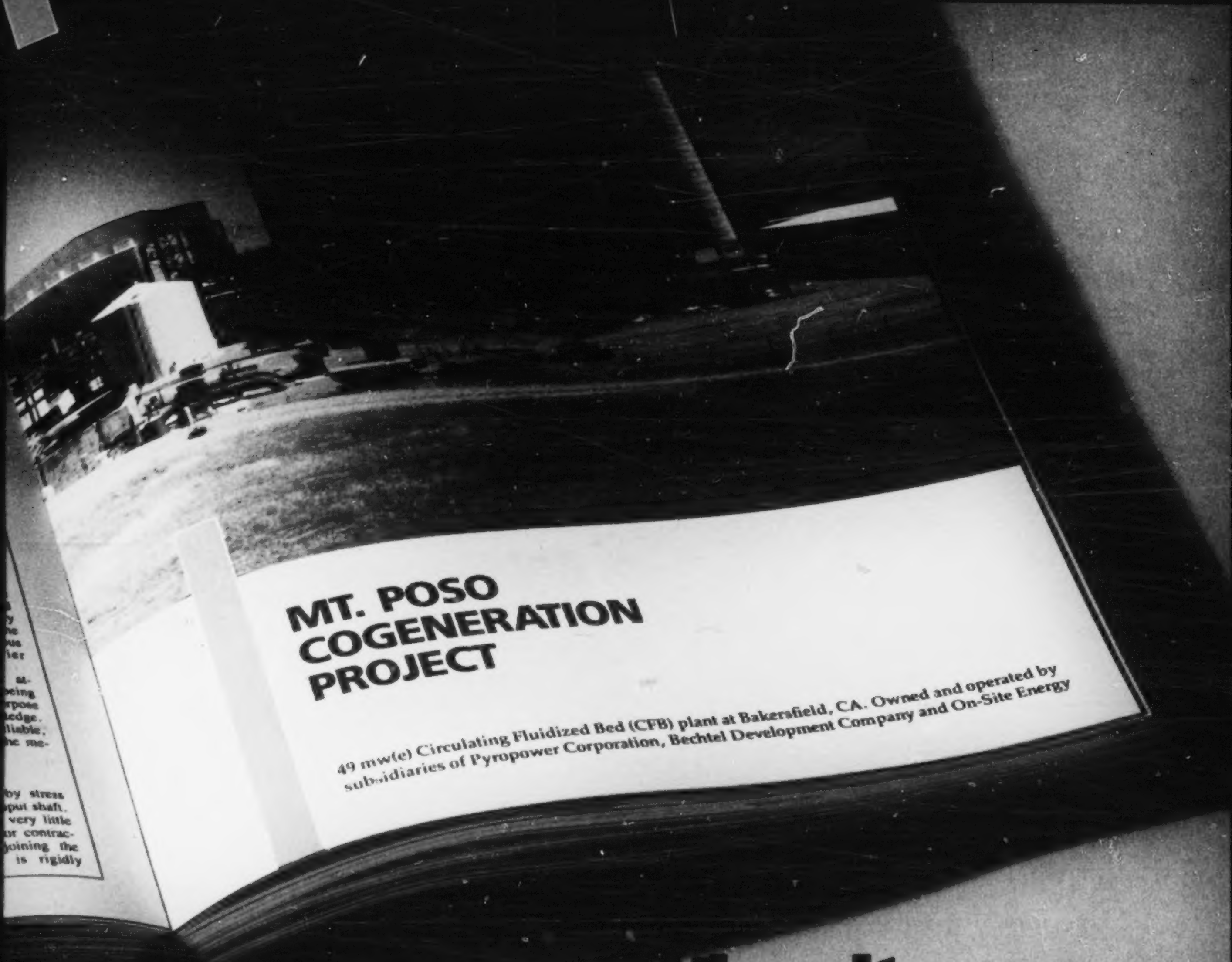
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Clean Coal Technologies: "Clean coal technologies" is a general term for dozens of projects designed to solve many of the current environmental problems associated with burning coal. The U.S. is now committed to a $5 billion program to accelerate the commercialization of clean coal technologies with industry providing at least half of the funds.

H.R. 3030 proposes to grant a three-year deadline extension (to the year 2003) to Phase II compliance for units repowered with certain clean coal technologies. But while these provisions are a move in the right direction, the bill could actually hinder research and development by forcing utilities to decide which technologies to use well before all the facts are in.

Many of these technologies have shown great promise, but won't be ready for widespread use in time for the utility decisionmakers. If utilities want to use these clean coal technologies to meet emission limits set by the proposed bill, they must commit to construction in 1997 under the current extension. Adding just two years to the Phase II extension (to the year 2005) would substantially increase the number of technology options for utility decisionmakers.

In addition to an unreasonably tight deadline, H.R. 3030 also limits the extension to only a few of the broad range of clean coal technologies under development. This puts pressure on managers to use conventional technology, such as flue gas scrubbers, with their high cost, low energy efficiency, and sludge disposal problems.

Clean coal technologies have the greatest potential for meaningful and sustainable emission reductions, without damage to jobs and the local economies of the areas which produce the higher sulfur coals. Their development will hinge on unprejudiced engineering innovation, and their acceptance in the marketplace will hinge on minimizing the risks to utility decisionmakers.

Restrictions should not be placed on which technologies will qualify, and inflexible deadlines should not be set for their development. In its present form, H.R. 3030 promises to limit technological innovation at some point in the next decade, regardless of the actual benefits of doing so. The minimum acceptable modification to the bill would be a two-year stretch-out of the clean coal extension.

Enforcement and Judicial Review: H.R. 3030 would make major changes in the enforcement provisions of the Clean Air Act, even though the current Act gives the government broad and effective civil enforcement and criminal prosecution powers. The bill would also limit the right to judicial review of EPA actions. In many respects, the bill departs from basic principles of procedural fairness and equity, limiting parties' ability to get a full and fair hearing.

A number of the enforcement and judicial review provisions of the bill are unfair and should be deleted, including provisions:

- Eliminating "home court" jurisdiction in enforcement actions, a provision that would give the government an unfair litigation advantage.
- Authorizing a "field citation" program, a provision that would bypass due process guarantees since defendants would have no right to a full and fair hearing.
- Insulating EPA enforcement orders and actions from judicial review.
- Insulating EPA "nonattainment" designations from judicial review and public notice-and-comment procedures.
- Giving EPA virtually unlimited emergency powers, and eliminating the protection in the existing act which requires judicial action to extend an emergency order beyond 24 hours.
- Allowing sources to be sued in successive citizen suits and EPA enforcement actions for the same alleged violation.
- Deleting the existing 30-day provision for notices of violation, a provision that gives sources an incentive to correct any infractions and that prevents EPA from bringing enforcement actions for violations that may have been corrected years earlier.
- Subjecting "negligent releases" of certain substances to criminal penalties, a provision that is unprecedented in the Clean Air Act and that is inconsistent with fundamental principles of criminal law.

The cumulative effects of these provisions are to "stack the deck" in civil and criminal cases against industry, remove incentives to correct past abuses, and short-circuit checks and balances traditionally imposed on governmental agencies. We can protect the environment without imposing such questionable legal conditions.

Conclusion

Any new legislation must be based on the concept of a lower cost approach to controlling SO2 emissions. H.R. 3030 is a good starting point for discussions of a market-based approach, but it needs some significant modifications like those suggested here if it is going to be successful. The $4.5–5.5 billion price tag of the bill is much too costly, particularly when the industry can meet the required reductions at 20–30 percent lower cost. EEI and its member companies intend to work with Congress and the Administration to incorporate needed changes in the bill as it makes its way through the legislative process. ■

By Gene Pokorny and James Murphy

Gaining The Competitive Edge Through Superior Customer Service

Understanding customer perceptions and attitudes can help utilities create a "clear value" proposition that advances benefits of electricity over its alternatives.

In an era of increased competition, electric utilities confront the same, basic marketing challenge all market-driven companies must face and resolve if they want to survive. That challenge—simply put—is to create in the minds of their customers a sense, a perception, that their products and services provide superior value.

Successful utility managers understand and accept that superior value is really superior perceived value. What's important is what's in the minds of customers. It is the belief of a utility's customers that by buying and using the company's products and services they get a net value superior to the alternatives available to them.

To create customers' perceptions of superior value vis-a-vis the alternatives (be they other energy sources or energy companies), an electric utility must provide and market a "clear value" proposition to its customers. What does it want its customers to believe about it as a corporation as well as about its products and services? Without a clear value proposition that customers can understand and appreciate, an electric utility cannot expect them to demonstrate "brand loyalty" in the face of competition.

Customer segmentation research done by Cambridge Reports for the Edison Electric Institute in 1985-87 collected data on electricity customers' changing needs, wants, and preferences, and provided many insights into the kinds of value propositions electric utilities could offer customers in today's energy services marketplace.

Results of these segmentation studies showed that customers think about and evaluate their electric utility as both a product and a service provider. In the product area, they evaluate electricity—its price, its reliability, its cleanliness, its safety, its quality, and whether it can be used and bought in ways that fit their needs and lifestyles.

In the service area, customers evaluate two separate though related aspects of an electric utility's performance. On one hand, they evaluate the customer service programs and activities the utility offers. These run the gamut from emergency repair activities to programs that help customers use electricity in ways that enable them to gain greater control over their usage and bills, to consumer information programs and community betterment activities, to programs that help customers with "special needs." On the other hand, customers evaluate the quality of service of the utility in all the interactions and transactions it has with them.

Customer perceptions and evaluations of an electric utility's service performance, then, are determined by not only the customer service programs that are in place, but also by the actual quality of service rendered in each program by the individual actions and behaviors of utility employees. (The sidebar on page 26 highlights the objectives and major findings of those studies. For a detailed description of them, see "Why You Need Satisfied Customers," *Electric Perspectives,* Summer 1986, pp. 20-27; "How to Earn Customer Satisfaction," *Electric Perspectives,* Fall 1986, pp. 29-39; and "Selling Electricity Can Earn Customer Satisfaction," *Electric Perspectives,* Winter 1987, pp. 8-19.)

To understand better how residential customers think about the day-to-day delivery of service quality by utility employees and how they currently evaluate alternative energy sources and energy companies, Edison Electric Institute commissioned Cambridge Reports to conduct a fourth customer research study in 1988. One thousand two-hundred and twenty-six interviews were done with residential customers selected to represent the entire adult U.S. population.

From the data collected in the Residential Customer Competitive Positioning Study, additional insights emerged that show that electric companies can make the service quality delivered in all their customer-company interactions a critical, defining part of their value proposition. By providing superior value to customers in this key area, as well as in the areas of customer service programs and the product—electricity—itself, electric utilities have the opportunity

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Robert Rathe/Folio, Inc

Electric companies can make the quality of all their customer-company interactions a critical asset in earning "brand loyalty."

to gain the competitive edge over alternative energy sources and energy providers.

How They Evaluate Energy Sources

To uncover the perceived competitive strengths and weaknesses of electricity as a home energy source, we asked all respondents in our national survey two sets of questions. First, respondents rated how important six considerations were to them when they decided what energy source to use for their home's equipment or appliances. Second, respondents rated electricity's performance on these same six considerations or product attributes. The performance of natural gas also was rated.

In deciding on an energy source for their homes, the most important consideration to customers is safety, followed by reliability, comfort, low operating costs, cleanliness of operation, and low initial purchase price for equipment and appliances. Respondents rate electricity significantly higher than natural gas on five out of six of these attributes—cleanliness of operation; low purchase price of appliances using this energy source; safety; and comfort. Natural gas is rated higher than electricity only from the perspective of operating costs.

From these ratings, benefit or preference segmentation analysis was done. Respondents who rated electricity higher than natural gas on a given attribute or benefit were placed into the electricity preference segment on that attribute. Those who rated gas higher than electricity on that same attribute were assigned to the gas preference segment. Those who rated gas and electricity equally on this attribute were put into the no-preference segment.

The two largest benefit segments for electricity are those who rate electricity higher than gas on cleanliness of operation and safety. Gas and electricity appeal to approximately equal numbers of people based on comfort, low purchase price of appliances, and reliability. People concerned with operating costs are the most numerous benefit segment among those who prefer natural gas, though the plurality in favor of gas is much smaller here than the pluralities favoring electricity in the areas of safety and cleanliness. Table 1 presents the results of this preference segmentation.

Table 1

Customer Preference Segments Based on Ratings of Electricity and Gas Performance in Six Benefit Areas

	Customer Preference Segments		
Benefit	Prefer Electricity	No Preference	Prefer Natural Gas
Cleanliness of operation	47%	33%	20%
Safety	46%	34%	19%
Comfort	34%	38%	28%
Low initial purchase price	34%	36%	30%
Reliability	29%	39%	32%
Lowest operating cost	27%	33%	40%

Table 2

Basic Customer Attitudes toward Energy Companies
(percent positive rating)

	Electric Company	Gas Company	Fuel Oil Company
Favorability	73%	79%	84%
Reasonable rates	47%	59%	—
Concern for customers	56%	58%	—

Demographic breakdowns show that the customer segment preferring electricity over gas on cleanliness of operation is more likely to be made up of customers under age 36, men, and those living in the Central states. The customer segment rating electricity higher than gas on safety is more likely to be younger (under age 36), male, and living in the Central states. Members of the electricity preference segment on comfort tend to be better educated (at least some schooling after high school) and younger (35 years of age or less). They are also more likely to live in the Northeast, Central, or Pacific states. Those who prefer electricity on low initial purchase price are more likely to be male, over age 65, and residents of the Northeast or Central states.

Those who prefer electricity to gas on reliability tend to be younger (age 25 or less), and residents of the Northeast. Those who feel gas is more reliable than electricity are more likely to be in the 36-to-45-year-old age group, and to be earning $50,000 or more annually. Finally, members of the segment preferring electricity to gas on operating costs are more likely to be under 36 years of age, have monthly operating bills of $25 to $45, and live in the Northeast. Preference for natural gas in the area of operating costs is higher than average in the Midland states.

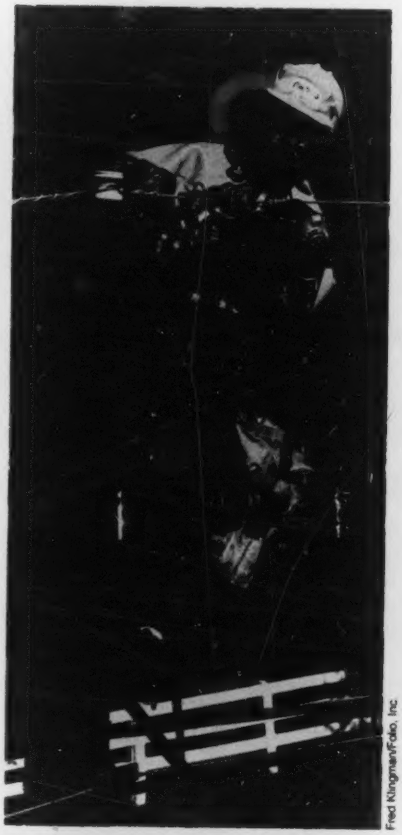
These findings were reinforced substantially by other analyses which showed that both gas and electricity are meeting or exceeding customers' expectations on comfort and reliability. Electricity has particularly strong marketing leverage in the area of safety—since it exceeds customer expectations, while gas falls short of these expectations. The only strength of natural gas over electricity is in the area of perceived ongoing operating costs.

How They Evaluate Electric and Gas Companies

Customers in the study were asked to evaluate the energy providers their households use on a set of basic measures—overall favorability, reasonableness of rates, and the concern the companies demonstrate for their customers.

While 73 percent of residential customers rate their electric company favorably, larger majorities rate their natural gas company (79 percent) and their fuel oil company (84 percent) favorably.

Demographic breakdowns reveal that overall favorability toward electric companies is higher among white customers; among middle-aged, older, and retired persons; and among those in one- and two-person households. Favorability is lower among customers who have experienced three or more interruptions in electric service over the last year. Not surprisingly, overall favorability also tends to decline as the size of customers' monthly electric bill increases.


Fred Kingman/Folio, Inc.

Customers rate reliability and emergency repair service among the utility activities most important to them.

On the issue of reasonableness of rates, electric companies are perceived to be at a competitive disadvantage. Fewer than half (47 percent) of electricity customers think their electric rates are reasonable, whereas 59 percent of natural gas customers think their gas rates are reasonable. For both electric and natural gas companies, dissatisfaction with rates tends to increase with the number of customer-initiated contacts—the two most frequent of these involving questions about billing and emergency service or safety issues.

Attitudes about electric and gas companies' concern for the well-being of customers were virtually identical: Fifty-six percent think their electric company demonstrates concern; 58 percent feel that way about their gas company. Table 2 presents these basic, comparative ratings.

How They Evaluate Utility Programs and Activities

In another set of questions in our national study, we asked customers to rate the importance to them of fourteen areas of programs and activities that an electric or gas company can offer. These activities ranged from activities in the product area (keeping rates as low as possible) to customer service programs (programs to help customers control their energy usage and bills) to quality of service activities (understanding and courteous employees).

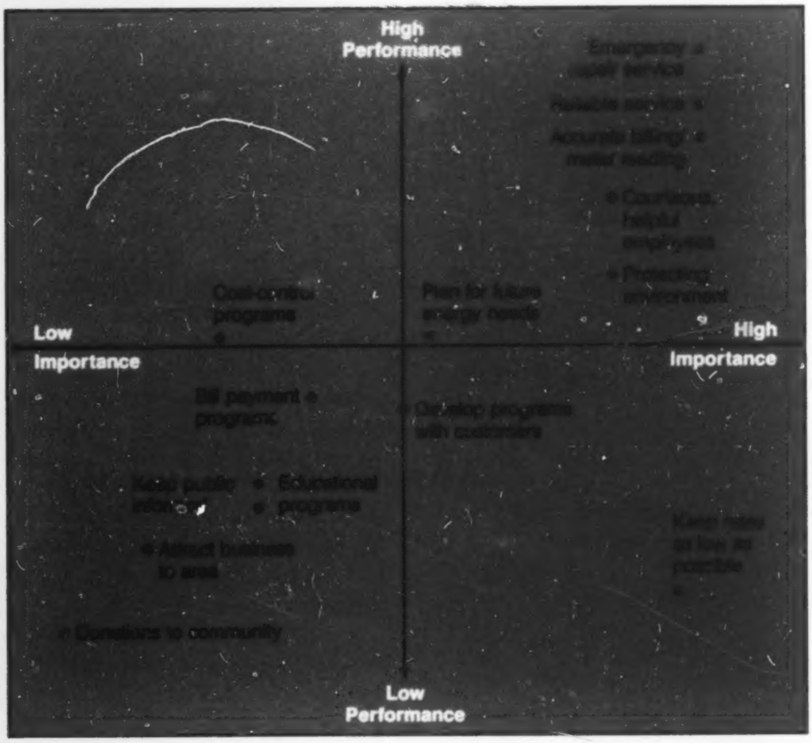
While customers rated all but two of these areas as important, the most important activities to customers are keeping rates low, service reliability, and emergency repair service. Following these in importance are the issues of competence and the quality of interactions with company personnel (meter reading and billing, the employees' attitudes toward customers), company efforts to protect the environment, and planning for future energy needs.

After rating the importance of these programs and activities, respondents went on to rate their electric and natural gas company's performance in each area. Based on the ratings customers gave, we created perceptual maps that simultaneously plot the importance to customers of the fourteen areas of activity, as well as customer perceptions of electric and gas company performance in each area.

The perceptual map for electric companies shows the industry's competitive strengths and weaknesses (Figure 1). In the upper right quadrant are those programs and activi-

Figure 1

Importance and Electric Company Performance Ratings of Fourteen Areas of Activity



ties rated higher than average in both importance and performance.

This quadrant shows that electric company customers attach the highest importance to emergency repair service, reliable service, and accurate meter reading and billing, with all three rated equally important. These are also the three areas that receive the highest performance ratings, with performance actually outdistancing importance on emergency repair service and service reliability. Meter reading and billing shows a perfect match between customer expectations and performance. Electric companies are also in a good position in the areas of employee performance and protecting the environment. While performance ratings are lower in these two areas, so are important ratings. Thus, a rough equilibrium exists between performance and customer expectations. Planning for future energy needs is a more marginal area, with importance slightly outdistancing performance.

The lower right hand quadrant reveals two areas of disequilibrium. Working with customers to develop mutually beneficial programs shows average importance ratings but below-average ratings of performance. Rates, not surprisingly in the current environment, are electric companies' troublesome area.

The programs in the lower left quadrant—bill payment programs, educational programs, keeping the public informed, attracting business to the area, and donations to the community—are lower in both importance and performance relative to other program areas, although it must be kept in mind that these areas are rated very important in absolute terms by most customers. For cost-control programs, electric companies are exceeding expectations, with average performance ratings and below-average importance ratings.

The perceptual map for natural gas companies shows there are small but statistically significant differences in customers' ratings of the performance of their electric and gas companies. All customers generally rate gas companies higher than electric companies on all of these activities except meter reading and billing, emergency repair service, cost-control programs, and protecting the environment. Higher gas company ratings on service reliability, rates, employee performance, and planning for future energy needs are the activities to which electric companies need to pay particular attention, since among customers these issues generally are rated as among the more important in relation to the others.

It is important to emphasize, however, that while gas company performance in the rates area is perceived to be superior to that of electric companies, it still falls short of matching the importance customers give to it, a clear indication that it is very difficult, if not impossible, to do enough in the pricing area to really satisfy customers. As a result, creating superior perceived value in customers' minds is easier in the realm of customer programs and service quality than it is in the realm of product pricing.

How They Evaluate Service Quality Delivery

As background to exploring how customers think about and evaluate the day-to-day service quality they receive in their interactions with utilities and utility employees, we asked customers about the frequency and content of their contacts with their utilities.

During the twelve months preceding this survey, over one-third (35 percent) of all electric customers and one-quarter (26 percent) of all gas company customers contacted their utility at least once. Electric company customers most often contact their company to report a power outage (29 percent) or to resolve an issue about billing or meter reading (32 percent). Gas company contacts center around the issues of billing or meter reading (29 percent) or emergency service and safety (19 percent).

Interruptions of electric service are not uncommon occurrences. Two-thirds (67 percent) of all customers experienced at least one interruption, half (49 percent) at least two, and one-third (33 percent) at least three interruptions of electric service within the past year. Most of these power outages (52 percent) lasted a half hour or less.

The prompt and efficient handling of calls and complaints is an important component of customers' perception of company concern for customers and overall company performance, as we have seen. When contacting their company, 43 percent of electricity customers had to speak to more than one company representative before resolving their problem, compared with 34 percent for gas company customers. Electric companies are most responsive to customer contacts about power outages and emergency service issues. They are less responsive with issues of billing and meter reading and of starting or terminating service.

Overwhelming majorities of both electricity and gas customers are at least somewhat satisfied with the way their respective companies handle their problems. But satisfaction is substantially higher among gas customers, especially those saying they are very satisfied—72 percent for gas company customers compared to 49 percent for electric company customers.

Four Dimensions to Service Quality

To uncover how customers think about service quality we asked them to rate the importance of 26 activities and behaviors that can demonstrate a company's quality of service performance. While nearly all of the service quality attributes we asked about—from trustworthiness and competence to personal attention and convenient hours—are considered extremely important by a majority of customers, we discovered through factor analysis of the ratings that most of them are correlated strongly with one of four underlying service dimensions:

1. Reliability/dependability

Table 3

Activities and Behaviors Behind Service Quality Dimensions

Reliability/dependability
Can be trusted
Do things promptly
Do things at the time promised
Are dependable
Respect for customer/conscientiousness
Act like they want your business
Keep secure and confidential records
Respect you as a customer
Are courteous
Keep precise and accurate records
Convenience/customer support services
Keep you informed about matters of concern to you
Have adequate support to do the job well
Make it easy to reach the right person when you visit
Have convenient locations to visit
Tell you when they will do things for you
Have convenient hours during which to call or visit
Professional manner/appearance
Have clean and well-maintained equipment and facilities
Know what your needs are
Are neat and professional looking

2. Respect for customers/conscientiousness
3. Convenience/customer support services
4. Professional manner/appearance

Table 3 presents the service quality activities and behaviors that make up these dimensions.

On each of the four dimensions, we divided residential customers into groups or segments according to their responses. Table 5 presents these segments on each dimension.

The largest "extreme importance" customer segment exists on the reliability/dependability dimension (52 percent) followed by respect for customer/conscientiousness (44 percent), convenience/customer support (31 percent), and professional manner/appearance (27 percent). Less educated and middle-income people are more likely to consider all four dimensions of service quality performance as extremely important. Respect for customer/conscientiousness is of higher than average importance for women and for people ages 36–55. Reliability/dependability is of higher than average importance for people ages 46 or older, while convenience/customer services tend to be more important for people in the 36-to-45 or over 65 age groups.

In another part of the national survey, we used a special procedure called conjoint—or trade-off—analysis to assess further the effect of service quality performance on customers' overall evaluations of utilities. Specifically, we looked at eight service quality dimensions: promptness, appearance, dependability, competence, convenience, accuracy, courtesy, and care for customers.

The eight service quality dimen-

High performance in less tangible customer service areas such as courtesy and appearance can "buy" an electric company significant good will to offset occasional lapses in more tangible service areas.

Table 4

Customer Segments Based on Importance Ratings of the Four Underlying Service Quality Dimensions

	Customer Segments	
	High Importance	**Extreme Importance**
Reliability/dependability	48%	52%
Respect for customer/ conscientiousness	56%	44%
Convenience/customer support services	69%	31%
Professional manner/ appearance	73%	27%

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sions or attributes significantly affect evaluations of electric and gas companies. An electric company described as not always having all eight of these attributes receives a rating of .68 on a 10-point favorability scale. An electric company described as always having all eight receives a favorability rating of 6.28. Whether or not an electric company is described as having these attributes accounts for up to a 5.60-point difference in electric company ratings on a 10-point company favorability scale.

Similarly, a gas company described as not always having all eight customer service attributes receives a rating of .77. One described as always having all eight receives a favorability rating of 6.19. These attributes account for up to a 5.42 difference in gas company ratings.

For both electric and gas companies, the four most important service attributes are accuracy, competence, dependability, and convenience. These account for 60 percent to 70 percent, respectively, of the explained variation in attitudes toward electric and gas companies.

But the other attributes of care, courtesy, appearance, and promptness also have an impact on overall attitudes as well—especially for electric companies. The increase in electric company favorability resulting from high levels of performance in the areas of courtesy and appearance will nearly offset the decrease in favorability caused by a decline in record accuracy.

With gas companies, customers are less apt to accept the trade-off of accuracy, competence, dependability, and convenience for promptness, care, courtesy, and appearance. Increased gas company favorability because of high levels of performance on courtesy and appearance falls far short of offsetting the decrease in favorability due to a decline in accuracy. In fact,

EDISON ELECTRIC INSTITUTE'S PREVIOUS CUSTOMER SEGMENTATION STUDIES

The Residential Customer Market Segmentation Study—1985

The Objective

Uncover residential customer attitudes about electricity and electric companies.

Findings

Customers think about their electric company along both a *product* and *service* ("a concern and caring") dimension.

Customers' views about their electric company's product and service performance equally explain broad judgments they make on issues like overall company favorability, fairness of rates, and ability to control energy usage and bills.

Customers trade off positive evaluations in the service, or concern and caring, area with negative perceptions in the product area, especially price perceptions.

The Residential Customer Program Segmentation Study—1986

The Objective

Identify which electric company programs and activities best demonstrate to various customer segments a commitment to superior customer service.

Findings

Customers think about an electric company's service performance along six to eight key dimensions.

Customers rate traditional "reliability of service" programs and activities as the single most important way an electric company can prove its overall customer service commitment.

Customers rate second most highly as a demonstration of superior customer service any electric company programs and activities that help them gain more control over electricity usage and bills.

The Residential Cost Segmentation Study—1987

The Objective

Identify residential customer market segments for electric company programs and end-use electricity applications that meet customer needs and preferences for having greater control over electricity usage and bills.

Findings

Customers think about electric company programs and end-use applications that help them gain more personal control over electricity usage and bills along three key dimensions.

Customers rate low investment/low involvement programs and applications not only as the most important way they can gain control over usage, but also as the activities they are most likely to engage in.

Customers rate second most highly in importance, as well as propensity to participate, high investment/high involvement programs and applications.

Smaller, though significant, customer segments like and are willing to participate in hard intervention programs and end-use applications—including direct load control—that help them gain efficacy over their electricity usage.

Target, or niche, market segments for cost control programs and applications can best be defined and identified through a combination of attitudinal measures and geodemographic cluster analysis.

no combination of any two of these latter four service attributes come close to offsetting decreased gas company favorability resulting from declining levels of accuracy.

This analysis clearly suggests that high levels of customer service performance in less tangible areas of service quality, such as caring for customers, courtesy, and promptness, can "buy" an electric company, more so than a gas company, a significant measure of good will that can compensate for occasional lapses in the more tangible areas of service performance. This, in turn, reinforces a major conclusion from earlier EEI customer segmentation studies—that customers' dual perception of electric companies as both product and service institutions creates unique marketing and communications opportunities for electric companies.

Choosing Your Unique Value Proposition

The fundamental strategic marketing challenge facing electric companies is to choose and provide a superior value proposition to customers. Given the dual perception customers have of electric companies as being equally product and service providers, that value proposition must provide perceived benefits in both the product and service areas.

In the product area, to the extent that pricing is currently not a competitive advantage, other product attributes should be accentuated—safety, cleanliness, comfort, and initial purchase price.

In the service area, both customer service programs and service quality performance must be maintained and enhanced as means for creating in customers' minds perceptions of superior service benefits. These perceptions are not only critical for their own sake, but also because they counterbalance possible negative customer price perceptions.

Superior customer service in the broadest sense is the path in today's energy marketplace that electric companies must travel to gain the competitive edge. Superior service builds "brand loyalty" to the company, which is the surest way to maintain and enlarge market share and profits in the competitive years ahead.

Thank you again!

All of us at Cambridge Reports appreciate that you, through Edison Electric Institute, selected us to conduct the "Residential Customer Competitive Positioning Study."

Building on the findings of EEI's earlier 1985, 1986, and 1987 segmentation studies, this recent study is the basis of the article "Gaining the Competitive Edge through Superior Customer Service" in this issue of *Electric Perspectives*.

If there is one thing we've learned in our 15 years of research experience—including more than 800 studies for over 100 utilities in areas like customer service evaluation, marketing, demand-side management, communications, and supply-side planning and forecasting—it is that customer attitudes and expectations are constantly changing.

Well-designed customer research like EEI's continues to be the surest route to understanding these changes, meeting the marketing challenges they present, and ultimately profiting from them.

We are proud and grateful to be part of this research effort.

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By Stan Benjamin

Utility Land Management

For many electric utilities today, land management is an important and specialized function.

"Buy land," the late humorist Will Rogers once advised, "They ain't making any more of the stuff."

U.S. electric utility companies wisely followed his advice and bought or leased in perpetuity millions of acres for hydroelectric dams, reservoirs, and watersheds; thermal power plants, cooling ponds, canals, shorelines, and buffer zones; transmission line rights-of-way; substations and maintenance yards.

Rogers neglected to warn them how complicated managing all that land would turn out to be.

Perhaps, back in the thirties, he didn't know. It was the era of dam-building, electrification, and a Depression that saw power plants as symbols of hope.

The frontier had long since closed and the United States was setting aside some of its finest scenery in National Parks. But land was still not considered scarce; and managing it, for a utility, was not exceptionally difficult. It was generally enough to allow swimming, fishing and boating on hydro reservoirs and to let crops grow and cattle graze under powerlines.

Times have changed. Today, land management has become an important and specialized function of the electric utility, pressed on all sides by government regulation, environmental constraints, inflated liability risks, and the recreation and resource demands of a growing population.

A century ago, the land area that became the "Lower 48 States" (excluding Alaska and Hawaii) amounted to about 37.4 acres per person; today, the average is less than 8 acres per person. The population nearly quintupled in 100 years; the land didn't. (". . . They ain't making any more of the stuff.") It's no wonder that human pressures on the unstretchable land have intensified.

"Land management is becoming a more and more important part of the company," says David T. Flanagan, Senior Vice President of Central Maine Power, a utility whose coordination of dams on Maine's Kennebec River system must satisfy simultaneously the needs of power generation, fishery maintenance, and whitewater rafting.

"There's a tremendous increase in public demand for access to these lands," he adds. "It's analogous to the way the National Parks have been deluged beyond their ability to maintain the facilities. There are going to be tremendous new maintenance demands that call for specialized staff to deal with the recreational use of utility property and to maintain standards and avoid abuse of the property."

At the other end of the continent, Southern California Edison Company has also had to increase its land management efforts—partly due to urban, not sylvan, crowding and partly because there's more fog than rain in the summer down there. (Stay with us and we'll explain that, eventually.)

"There is a growing awareness that there's more to managing utility companies than the traditional activities," says Tom Houghtaling, Supervisor of Land and Property for Minnesota Power. "Also, there's some increase in the land management staffs, and people working in our field have had a lot more training. . . . There's a need to exchange information."

In the mid-1970s the Edison Electric Institute (EEI) established a National Land Management Task Force precisely to promote information-sharing through annual workshops, a newsletter, and similar activities. Houghtaling is its current chairman.

Its early focus was on recreational management at hydro-electric facilities regulated by the Federal Power Commission—now the Federal Energy Regulatory Commission (FERC).

"As people with wider interests attended our workshops and joined the Task Force, we broadened it to cover all real estate and land management topics," Houghtaling says.

Despite this organizational focal point, neither EEI nor the electric utility industry in general has a unified land management policy.

The reason, says Jim Roewer, EEI Environmental Scientist-Land Use, is that the electric industry and its issues are so diverse.

"You have a number of distinct utilities, operating under different circumstances over a huge geographic spread. Some utilities have predominately thermal generation, while others rely more heavily on hydro. Some companies operate in more industrialized or urbanized areas, and others cover rural areas. Some companies have large land holdings, others have relatively little. Different land management philosophies arise out of these differences and many,

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Stan Benjamin is a Washington, D.C.-based freelance writer.

Terry E. Eiler/Folio, Inc.

The variety of land-related problems that utilities have confronted has inspired an equal variety of often ingenious management practices.

many others. The approach really has to be on a case-by-case basis."

Specific cases bring this conclusion to life.

For Minnesota Power, Houghtaling says, "Timber and wildlife management programs are good land uses. They regenerate renewable resources and contribute to the local economies, which are timber-based in a lot of our communities."

The company also grants land leases at hydro reservoirs for cabins and campsites but compared to other parts of the United States that's not as pressing a need in Minnesota, a land of natural lakes. "We have more land than people, I guess," Houghtaling says.

In Texas, on the other hand, natural lakes are scarce. Utility reservoirs are often the only water recreation opportunities near large population centers, and may double as state parks.

Again, in Minnesota and elsewhere some utilities are trying to cut costs by selling off excess land: used but no longer needed; purchased for needs that never materialized; or accepted, although unneeded, as part of a larger package.

But in Florida, California, Maine, and other states—especially in densely populated areas—getting land is the problem, not getting rid of it.

"For operating properties, the biggest land use challenge is locating facilities," says Flanagan. "In more and more parts of the country it's becoming a tremendous challenge to get the environmental permits and avoid local grassroots opposition to the location of vitally needed, but not terribly attractive, facilities.

"Things are sufficiently tight up here that I'm talking about substations and any kind of distribution facilities, not just large power plants."

The variety of problems has inspired an equal variety of often-ingenious management tactics.

■ Northeast Utilities Service Co. has attracted more than one million visitors since 1973 to recreational lands at its Northfield Mountain Pumped Storage Hydroelectric Station, in Massachusetts. The project offers boat-camping, picnicking, camping, a nature area, wildlife management and seasonal hunting, fish passages with underwater win-

Southern California Edison finds that horticulture is one of the best uses for its rights-of-way. It also licenses them for other uses, including city parks.

Southern California Edison

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dows and an observation deck, and an extensive trail system.

- Columbus Southern Power Co. successfully initiated timber harvesting on 4,000 acres in Ohio through a cooperative agreement with the Forest Technology program of nearby Hocking Technical College. The school gains access to hands-on field instruction, and CSP gains the school's expertise.

CSP manages other properties for recreation, timbering, agriculture, oil and gas development, hunting, and fishing.

- Pennsylvania Power & Light Co. has mapped, inventoried, and classified 39,000 acres by land use objectives, including: timberland and wildlife protection; cropland (part of each crop is left for wildlife); unique natural areas for hiking only; other natural environment areas; public recreation; education; and industrial/commercial use.

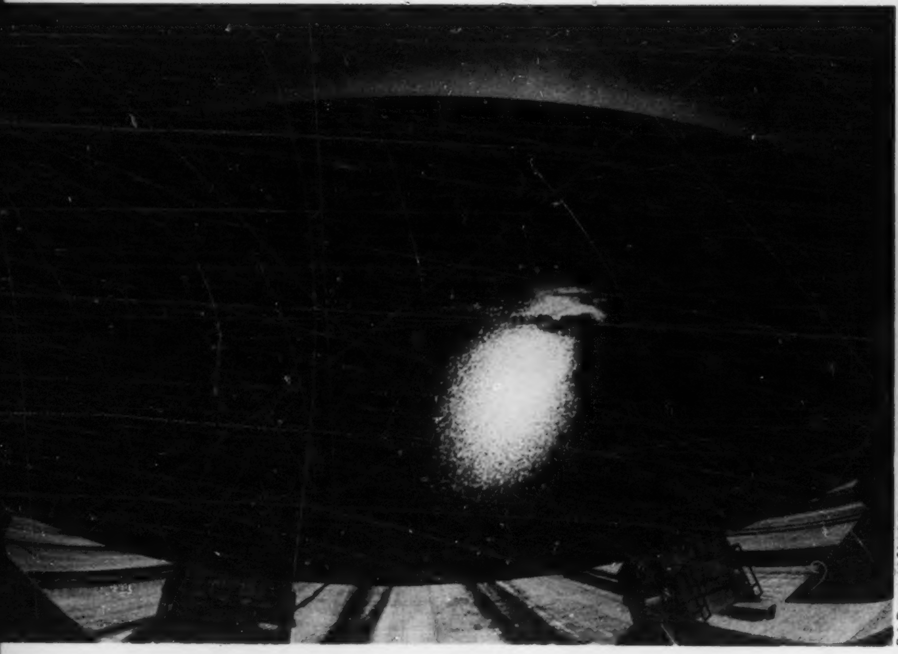
Warm discharge water from a power plant is piped to heat 12 acres of commercial greenhouses growing flowers, bedding plants, tomatoes, and lettuce.

- Southern California Edison Co., whose land management problems center largely on transmission line corridors through the jam-packed Los Angeles metro area, finds that horticulture is one of the best uses for its rights-of-way. It's beautiful and it's profitable, says Don Baumann, the company's Supervising Real Properties Agent. The utility also licenses its rights-of-way for agriculture, other commercial uses, and city parks.

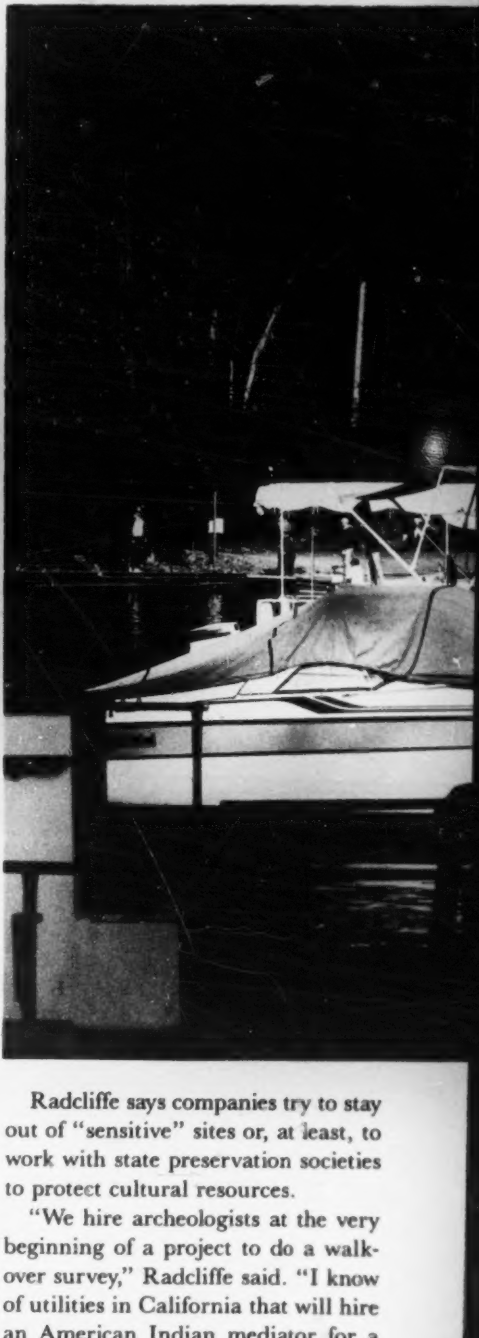
- In November, 1988, New England Power Co. (Massachusetts) signed a comprehensive agreement under which The Nature Conservancy will manage some company land to protect eleven "ecologically significant sites" along the Connecticut River. The company also participates in the American Forest Council's tree farm program, managing 26,000 acres in New Hampshire, Vermont, and Massachusetts as timberland, watersheds, wildlife preserves, and recreation areas.

- When plans for a power plant were dropped, Iowa Power Co. turned more than 3,000 acres east of Des Moines into farmland. It filled ditches, built new waterways, developed a soil conservation plan with County advice, established cover for pheasants and other wildlife, and designated 240 acres as a research farm. The electric utility was named "Outstanding Jaspar County Farmer" of 1985.

- Illinois Power Co. drew up a comprehensive plan for its Clinton Nuclear Power Station, located on a 14,700-acre site including a 5,000-acre impoundment. The utility operates a visitor center. It leases a marina to private operators, farmland to tenant farmers, and the lake plus 10,200 acres and a long list of recreational facilities (all free) to the state Department of Conservation. It even planted 400,000 trees to replace those destroyed for the impoundment. Some 862,000 people visited the site in 1987, ranking it among the ten most-visited state parks in Illinois.



Bob Daemmrich/Uniphoto



In Texas, some utilities have leased shoreline properties to the state for use as public parks since utility reservoirs are the only bodies of water available to many Texans for recreational use.

Texas utilities, too, have developed a mutual-benefit arrangement with state agencies.

"We're pretty much in a world of our own down here," says Frank Schlicht, Principal Scientist in the Research Division of Houston Lighting & Power Co. "There are no state or federal regulations. Our PUC does not require us to do any kind of land management when we build new facilities.

"But utility reservoirs are the only water bodies people have, in large areas of the state, for water-contact recreation. So, many companies have made them available to the public."

In Texas, when a reservoir is opened to the public free of charge, the state Parks and Wildlife Department assumes responsibility for its fishery management.

"It just makes sense to make the shoreline available too," says Schlicht. During the past two decades, he reports, some utilities have leased reservoir shoreline properties to the state "for a dollar-a-year-plus-considerations," for operation and maintenance as state parks.

A Cultural Resource Management (CRM) Task Force split off from EEI's National Land Management Task Force some years back but their paths have inevitably converged again, and this year's National Land Management Workshop was sponsored jointly by the two groups.

Darlene Radcliffe, Licensing Specialist at Cincinnati Gas & Electric Co. (CG&E) and chairperson of the CRM Task Force, points out that the National Historic Preservation Act requires a cultural resource survey before construction of any facility that relies on a federal permit or federal funds. Some states also require permits.

"More and more companies are taking historical and archeological resources into consideration at the very beginning of a siting study," she reports.

Radcliffe says companies try to stay out of "sensitive" sites or, at least, to work with state preservation societies to protect cultural resources.

"We hire archeologists at the very beginning of a project to do a walk-over survey," Radcliffe said. "I know of utilities in California that will hire an American Indian mediator for a survey walk-over or to be on site when an area is excavated.

When CG&E planned additional construction at its Miami Fort coal-fired power plant, an archeology graduate student in a field class from the University of Cincinnati uncovered a prehistoric site "so sensitive that we just built a fence around it and left it alone."

Philadelphia Electric

Glen Cove Marina is only one of several improvements Philadelphia Electric made under its award-winning land management plan for the area surrounding its Conowingo hydroelectric dam on the Susquehanna River.

"It's a small site," Radcliffe explains, "but the cost of excavation would be immense."

Central Maine Power has subcontracted the University of Maine at Farmington to perform archeological excavation of sites at some hydroelectric projects. The artifacts are donated to the state museum at Augusta.

Even protecting a historic house is not as simple as it sounds, Radcliffe says: "It's important to have the building in use or occupied, and that may require extensive renovation. Usually these sites are not close to a lot of development. If you leave a building empty there may be vandalism problems."

EEI's National Land Management Task Force concluded that electric utilities have done far more in land management than many, even within the industry, give them credit for. To recognize these achievements, the Task Force has established a National Land Management Awards Program.

Federally-licensed hydroelectric plants, long required to provide recreational access to impounded lakes, had a head-start in land management over non-licensed facilities. To play fair, the Task Force offered two awards: one for licensing-related land management, the other for land management unrelated to licensing.

This year, EEI named the first two winners: Philadelphia Electric Company (licensing-related) and Florida Power & Light Company (non-license).

Philadelphia Electric, owner of some 50 square miles in Pennsylvania and Maryland, was recognized for overall land management planning, stimulated by the need in 1976 to relicense its Conowingo hydroelectric dam on the Susquehanna River, but going well beyond traditional license requirements.

"In applying for relicensing, we got into comprehensive planning for the entire project," says Tom Clime, Supervisor of Property Management.

"We're not interested in tokenism, just doing the minimum to get by; that's not our philosophy. If there's a demonstrated need, we take responsibility and do it."

The Conowingo plan covers not only recreational, but also educational, environmental, forest management, and commercial development planning. The company started implementing it even before it received final FERC approval in 1988.

It includes improvements of a "fishermen's park," a marina, boat launch ramps, trails, picnic areas, and campgrounds. A 7,600-square-foot, $3.7 million swimming pool—"the crown jewel," Clime calls it—is already completed on a site overlooking the Conowingo Project; nearby is a recreation headquarters building including a visitors' center and meeting rooms for public education programs.

Philadelphia Electric did not stop there.

"We have applied the planning concept to all the land the company owns, including all of the generating stations and transmission lines," Clime says.

Florida Power & Light Co. won an

EEI award for its management of land scattered through a service area encompassing half of Florida and including five major power plant sites.

The jewel in FP&L's crown is the 400-acre Barley Barber Swamp, carefully preserved in its natural state on the Martin oil-fired power plant site east of Lake Okeechobee.

Jay Molyneaux, Director of Land Management, says FP&L bought the 11,500-acre site in 1972 and planned a 7,000-acre cooling pond that would have flooded the Barley Barber tract. But that tract was one of the few pristine cypress swamps left in Florida and the company realized it should be saved, so it detoured the pond embankment. Now the swamp forms a wet-on-wet peninsula projecting into the cooling pond.

The cooling waters and swamp waters are separate, but FP&L couldn't leave it at that. Road and railroad construction unrelated to FP&L had interfered with its natural drainage. To preserve the swamp, FP&L must flood and drain it seasonally, mimicking a natural water cycle.

In addition, Florida's gentle giant, the endangered manatee, is attracted to the warm discharge waters of several power plants during the winter months. At its St. Lucie site on the Atlantic south of Fort Pierce, FP&L offers public beaches and facilities, but controls access to the nesting grounds of sea turtles by means of guided tours to protect the animals from disturbance.

The EEI National Land Management Awards Program will be repeated in 1990 and is intended to become an annual event.

Some utilities are beginning to turn the power of the computer against the more difficult land management puzzles, using it to catalogue and assess resources, then generate overlays and plans that can be revised and compared in the blink of an EXECUTE command.

But there is little hope that they will discover any final, this-is-it-don't-bother-me-again land management plans.

"Land management is becoming much, much more complex all the time," says Molyneaux. "Old issues never seem to die, and new ones are born continually."

Among the thorniest recently-emerged issues are the expirations of hundreds of hydroelectric project federal licenses in the next decade or so; the increasing difficulty of gaining rights-of-way through urban/suburban areas; hidden hazardous wastes; and the ethereal "EMF" scare.

Central Maine Power depends heavily on waterpower and has 13 hydroelectric plants up for relicensing by the end of 1992.

"It's one of the heaviest caseloads of any utility in the country," says David Flanagan. "So instead of going at it piecemeal, we planned on a

Florida Power & Light chose to alter plans for a cooling pond to preserve Barley Barber Swamp, one of the few pristine cypress swamps left in the state. A company-built walkway enables over 2,000 visitors a year to enjoy its natural beauties.

regional basis in a coordinated fashion for all three of our river systems. We've been working on it for better than two years. We put the final plan together last fall and have been working toward implementation since then."

Reaction, at both state and federal levels, has been favorable, he says, but CMP is taking no chances.

"There is no objective standard of measurement, but I think the variety of amenities we are offering is more than the FERC might reasonably have expected, and it's responsive to the needs of the state and localities

Florida Power & Light

PHILADELPHIA ELECTRIC'S CONOWINGO PROJECT

Philadelphia Electric Company's development of a comprehensive land management plan for its Conowingo Project was a study in complexity. Damming the Susquehanna River, the project straddles the border between Pennsylvania and Maryland, involving a daunting variety of local, state, and regional jurisdictions.

The company hired Urban Research and Development Corp. of Bethlehem, Pa., to pull it all together.

"The consultants worked with everybody," says Tom Clime. "They worked with us. They met with intervenors and other interested parties. They surveyed the opinions of current users of the project lands and borders.

"They examined virtually every recreation plan within 40 miles, the county plans in both states.

"There was a recognized need for swimming," Clime continues. "The question was how to provide it and where it should go. Many alternatives were considered, including 20 sites. To help us decide, we formed an interagency and community committee that met with us and our consultants every step of the way. A swimming pool with a good view of the project was chosen as the best way to handle the need.

"So when it came to the recreation master plan, we had already set up a close working relationship with all these groups: the Susquehanna River Basin Commission, the Maryland Department of Natural Resources, the Pennsylvania Bureau of Parks, the Fish Commission, the Game Commission, the county planning commissions, the parks and recreation departments.

"I think the key to success is to keep the channels of communication open and try to stay away from the adversarial process that seemed so prevalent in the early 1970s," Clime says.

"I think there's probably a mutual recognition in the utility industry and the governmental sector that those adversarial proceedings are very time-consuming and probably very counterproductive.

"We kept everybody involved in the planning process. We kept their input coming, and it became a part of the overall plan itself. And it worked."

FP&L'S BARLEY BARBER SWAMP

Florida Power & Light Co. was able to preserve the pristine Barley Barber Swamp area with relatively little hassle. The previous owners had left it in its natural condition. FP&L would have to dike it off and control an appropriate water cycle; but it was the company's choice to make.

"We have a lot of environmental activities, and Florida has a very fragile ecosystem," says Jay Molyneaux. "So when we found that it was in such good shape and that we could preserve it, that's what we decided to do."

In addition, FP&L built a 5,800-foot wooden walkway through the swamp so visitors could share its subtle beauties. More than 2,000 people visit the area each year. Molyneaux expects the number to increase.

Molyneaux credits Ross Wilcox and the FP&L Environmental Department, Site Supervisor John Reynolds and his predecessor Steve Day, now Superintendent of all FP&L sites, and their staffs, with the success of Barley Barber.

Should FP&L ever modify the adjacent Martin power plant, it will still continue to preserve the swampland, he says.

"As far as we're concerned, the Swamp is not for changing. It's there, we're proud of it, we like it."

"We have all kinds of plants and animals. At 5:30 in the morning, you can see rattlesnakes, eagles . . . we have a couple of river otters. We've even seen pug marks (footprints) of a Florida panther, which is very, very rare, but we've never seen him or her. This is really a fascinating place if you don't mind getting eaten by mosquitoes."

Jacob Motte, a U.S. Army surgeon who saw the swamp in the [illegible], was less [illegible] minded. Molyneaux quotes Motte's report: "It is, in fact, a most miserable region to live in." Then Molyneaux adds gleefully, "We've preserved his 'miserable region,' exactly as he saw it."

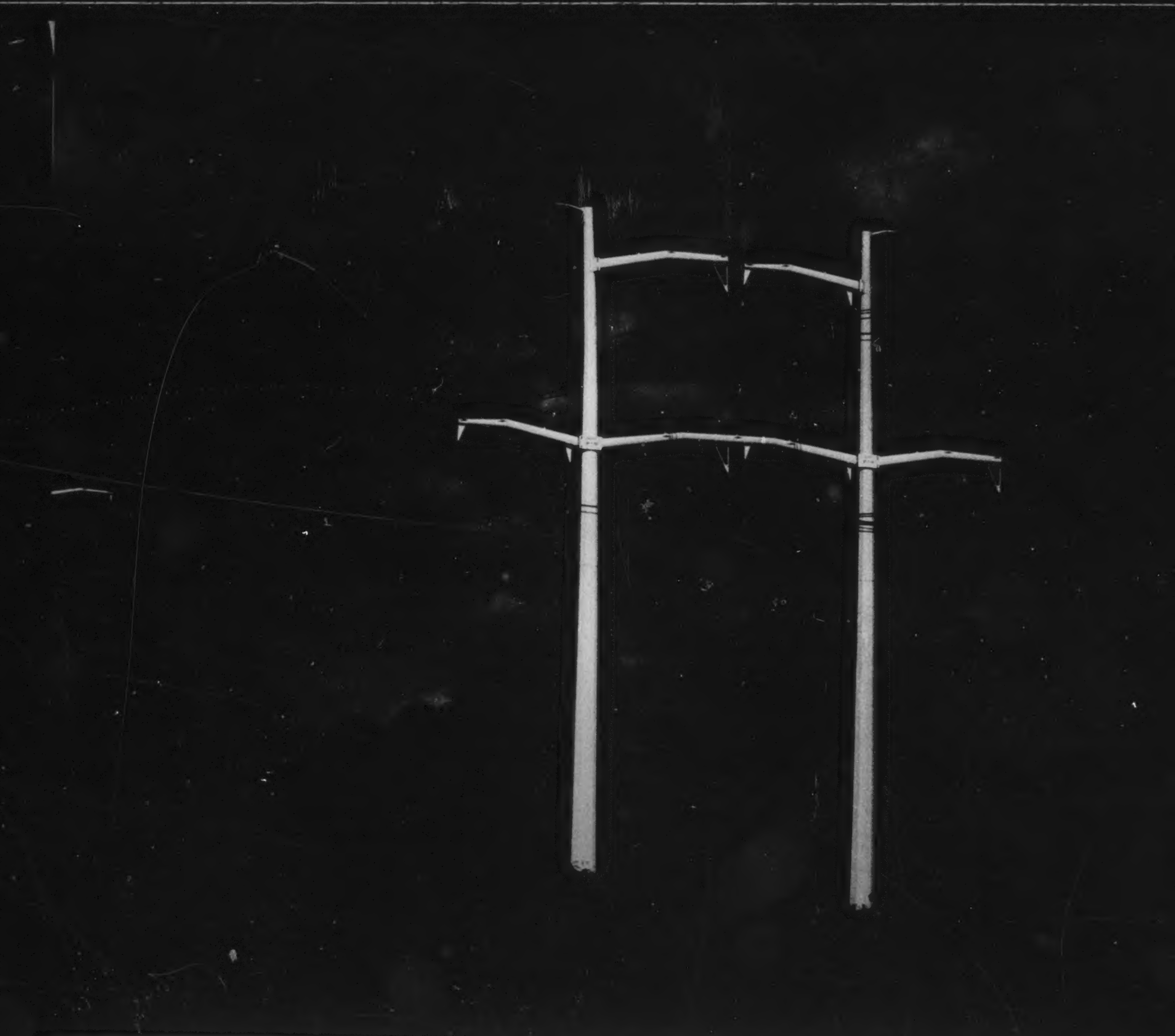
"It's beautiful," he sighs, "it really is."

Frederick Stork/Foto, Inc.

Siting transmission lines has grown increasingly difficult over recent years as public concerns about the health effects of electromagnetic fields have grown.

up here," says Flanagan. "We're willing to go the extra mile to show that we have been a worthy licensee and deserve relicensing."

Houghtaling says hydro relicensing has become a worrisome issue for many utilities because "The rules have changed and have become more challenging. There are more things



to consider and, I guess, more regulation over the utilities in deciding how they are going to manage these sites."

(Will Rogers also said: "I don't make jokes. I just watch the government and report the facts.")

Acquiring rights-of-way and facility sites is another growing problem.

"Instead of just buying it and building your line, you now have a hundred-fold increase in concerns with the public infrastructure, the existing residential or commercial areas," Molyneaux says. "You have to meet all the requirements everybody imposes on you. It becomes a much more sophisticated process."

Baumann, in L.A., says "one of our primary reasons for licensing our land to begin with is to gain acceptance of our rights-of-way, to make them pleasing to look at and compatible with the neighborhood.

"Another reason is to minimize maintenance. Dumps are difficult to find any more in a big urban area, and dumping can be a very expensive problem on a vacant right-of-way. You could probably fill a trash truck every week from a vacant five-acre parcel."

Even worse than casual dumping is the risk of finding hazardous wastes on a property you've just acquired—or having someone else find it on a property you've just sold. Nobody wants to buy or sell another Love Canal.

R. Lee/Unphoto

Many electric utility companies have developed comprehensive land management plans for hydroelectric projects that go far beyond federal licensing requirements.

"That's a question a lot of land managers are facing, particularly in areas where there's been large urban and industrial development," says Houghtaling.

Philadelphia Electric, for one, has adopted a phased hazard-assessment process similar to guidelines developed by EEI. Central Maine Power began "environmental audits" in 1988, "trying to stay ahead of the game," says Flanagan.

And then, what are land managers to make of "the EMF issue"? [See *Electric Perspectives*, May-June 1989.] That issue stems mainly from a study in the Denver area which reported that the presence of strong electromagnetic fields (EMF) around powerlines seemed to coincide, slightly and statistically, with occurrences of childhood cancer. A number of other studies showed no serious health concerns and the question remains scientifically unresolved.

Justified or not, fear is having its impact.

A recent report for EEI by American Trails expresssed concern that efforts to establish public recreational trails along utility powerline rights-of-ways could be scuttled by the EMF issue. (*Trails and Electric Utility Lands: A Model of Public-Private Partnership.*) A program started by the New York State Public Service Commission in 1972 to encourage recreational and educational use of transmission corridors was suspended in 1980 because of worries about EMF.

INTENTIONAL
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David M. Doody/Uniphoto

Public trails along utility rights-of-way can be particularly valuable in urban areas where outdoor recreational lands are limited.

When Central Maine Power proposed a power contract with Hydro Quebec, the Maine legislature considered a law to restrict the size and location of powerlines. "It was defeated, but it will be back," says Flanagan.

But Southern California Edison has a more immediate problem on rights-of-ways that it occupies under legal easements—and here's where that business about fog-versus-rain gets explained.

"In our region, we're lucky if we get any rain from mid-April to November," Baumann says. "During that dry season, a lot of dust settles on transmission line insulators and there's no rain to wash it off. The first time a fog moves in, power will leak across that insulator. So we have to go up and down the rights-of-way and wash insulators, maybe three times a year.

"We're spending a lot of money today on legal activities to protect our access rights under those easements against encroachments on the properties—buildings, houses, swimming pools' decks, fences, what have you.

"We've had to increase our staff and most of it is devoted to protecting those rights from encroachment.

"If you don't fight it, you end up with a right-of-way that you can't get on."

Buy land. . . ? To utility executives today, the words of 19th century philosopher Ralph Waldo Emerson may sound more up to date: "If a man owns land, the land owns him."

Will Rogers probably had a snappy reply on the tip of his lariat, but then he never had to manage land for an electric utility near the end of the 20th century.

Listen here, Will: it's no joke. ▰

Eric Ackerman and Russell J. Profozich

Innovative Rates and the Just and Reasonable Standard

As growing competition shifts utilities from price "makers" to price "takers," new regulatory criteria are emerging for evaluating the justness and reasonableness of innovative rates.

For regular readers of *Electric Perspectives* it will come as no great surprise to learn that competition in electricity markets is growing. Competitive themes have pervaded the utility trade press in recent years, appearing in articles about excess capacity, Canadian hydropower, cogeneration, proposals for bidding and IPPs, least cost planning, etc. All are part of the structure of competition in today's electricity markets.

What may be less evident is the extent to which competition is stressing the institution of rate regulation. Market rhetoric notwithstanding, public utilities continue to be price-regulated and will be for the foreseeable future. Given this fact, the growth of competitive forces is leading to a hybrid regulated/market system which today's institutions were never designed to handle.

For regulated utilities, competition means that prices must now meet a *market test*, in addition to the traditional *regulatory test*. Rate and marketing departments increasingly are being asked to develop prices that simultaneously can preserve and extend load, prevent the migration of ratepayers (and revenues) away from existing rates, and satisfy regulatory requirements for rates that are "just, reasonable, and not unduly discriminatory."

For public utility commissions, competition means that ensuring that rates are just, reasonable, and not unduly discriminatory is becoming a far more complicated proposition than it used to be. Gone are the days when regulators could rely on fully allocated embedded cost as the sole criterion for determining just and reasonable rates. In today's market, customers have options, and increasingly they are exercising those options to secure lower priced power.

Regulation is challenged, therefore, to develop new approaches and new criteria which can take these new realities into account. One of the ways it is doing so is through the development of "innovative rates," the new, market-oriented rates with which some investor-owned utilities are responding to competitive conditions in their service territories. These nontraditional rates, in turn, are stimulating the search for new regulatory criteria to ensure that all rates remain just and reasonable.

These innovative rates and the new regulatory criteria which are evolving in response to them are the subjects of this article. Throughout this discussion, we rely on research into innovative rate precedent published recently by Edison Electric Institute. (*Innovative Rates in the Investor-Owned Electric Utility Industry*, pub. no. 04-89-01.)

Innovative Rates

Growing competition means that regulated utilities need greater pricing flexibility than ever before. To understand why this is true, we need only to consider the growth of competition in terms of the transition from utilities as price "makers" to utilities as price "takers."

Under the traditional regulatory framework, utilities and commissions are price *makers*: utilities develop prices, subject to review and approval by regulators, without explicitly having to take into account the pricing policies of other sellers. The regulators's responsibility is to ensure that prices are fair, reasonable, and not unduly discriminatory, which in practice has come to mean limiting prices to costs which the utility has incurred in providing service, as recorded in its book of account. These costs include a fair return on invested capital.

In competitive markets, sellers are price *takers*: the market price is determined by the interaction of multiple buyers and sellers, and the individual firm is powerless to raise prices above the market price. To do so simply results in sales lost to other competitors. In such markets, sellers follow the market price, adjusting output to maximize profits, given their marginal costs of production.

The growth of competition means that utilities must increasingly price their services in response to market conditions. And since energy markets are inherently dynamic, utility pricing must be a great deal more flexible than traditional ratemaking practice has generally allowed.

Eric Ackerman is Manager, Regulatory Policy, for Edison Electric Institute. Russell Profozich is an energy consultant.

Large industrial customers have the most power supply options and, consequently, the most bargaining power when it comes to rates.

Economic development rates are especially useful in industries and states that lost manufacturing jobs in the 1980s.

Innovative rates, defined as retail rates that depart from fully allocated embedded cost design and that are developed in response to competitive market conditions, are a phenomenon of the 1980s. EEI has been tracking innovative retail rates for some years, using a database that is updated monthly from information published in the trade press or culled from primary sources (e.g., tariff sheets, commission orders). While our coverage is not totally inclusive, we do believe the contents are representative.

Sorting the sample by year of approval (or year of filing for proposals that were rejected or are still pending) produces the pattern reflected in Figure 1. If this distribution is interpreted as a measure of the growth of competition, the results suggest that competitive forces have grown steadily during the 1980s, accelerating particularly in the last three years (i.e., 1986–1988).

The intent of these rates, in terms of their business/market objectives, speaks volumes about conditions in today's electricity markets. As shown in Figure 2, 43 percent of the sample involves economic development rates. These are rates offered to induce investment in the service territory; they typically offer deep discounts (for a limited period) to incremental consumption by existing customers or by new customers who locate in the service territory. Not surprisingly, economic development rates are particularly prevalent in states that lost manufacturing jobs during the 1980s (e.g., New York, Pennsylvania, Ohio, Indi-

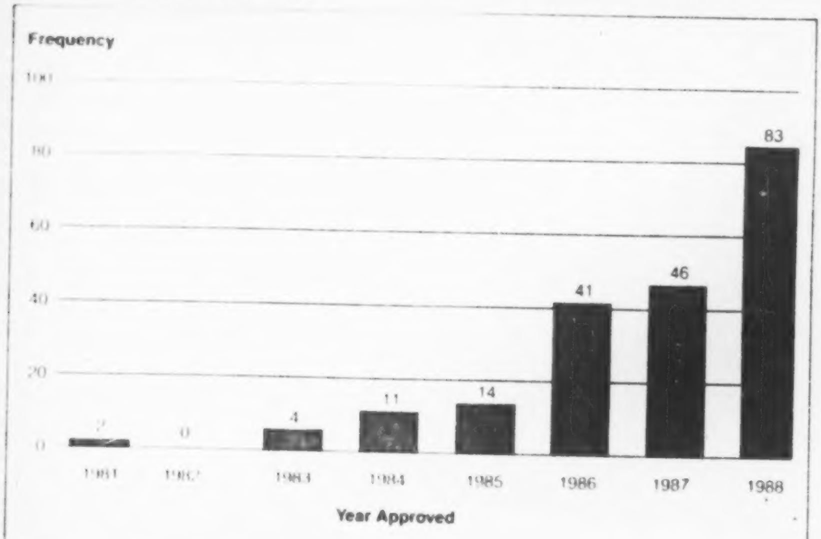
Davison Jones Inc./Uniphoto

ana, Illinois, Michigan).

Another 25 percent of the sample involves load management rates. These are rates which provide incentives for customers to change their consumption behavior in ways that increase system-wide efficiency (e.g., by shifting consumption from on-peak to off-peak hours). Load management is a high priority in many utility systems today, owing to concerns about declining capacity margins and the costs of new supply (e.g., environmental, capital costs). Another 14 percent of the sample in-

Figure 1

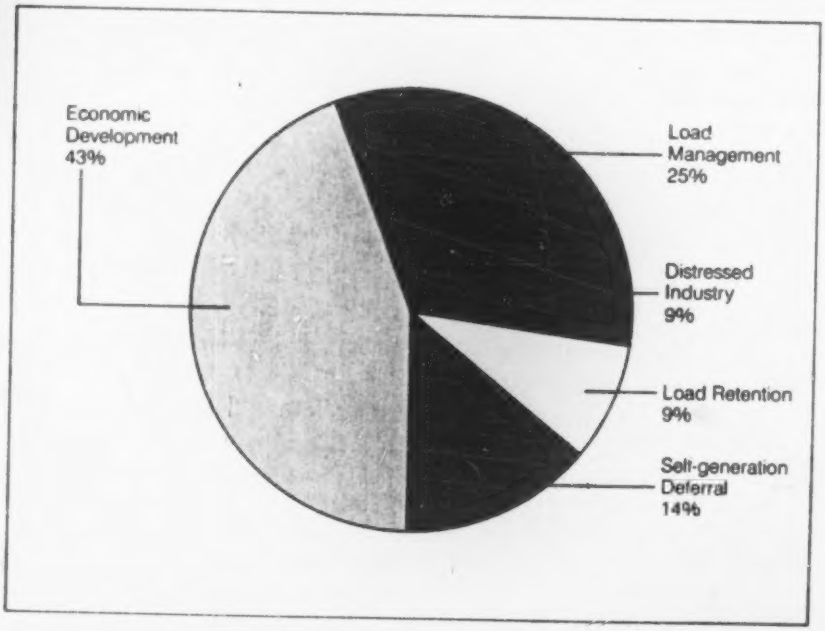
Growth of Innovative Rates



Source: EEI Rate Regulation Department

Figure 2

Business Intent of Innovative Rates



volves self-generation deferral rates. These are rates intended to prevent uneconomic bypass, a condition in which a customer develops his own on-site generation at a marginal cost higher than the utility's. Deferral rate proposals are perhaps the best example of the growth of competitive pressures on the part of large industrial customers and of the associated regulatory shift of utilities from the position of price maker to that of price taker.

Another 9 percent of the sample is associated with competitive load retention objectives. These are rates developed in an effort to compete more effectively with other utilities. The final 9 percent of the sample involves rates developed as short-term emergency measures to try to shore up distressed industrial customers (i.e., customers who are becoming insolvent). Typically, these rates depart from embedded costs to base rates on some index of the market price of the customer's product.

A look at the classes of customers for whom innovative rates are being developed suggests that it is large industrial customers who have the most competitive options and, therefore, bargaining power. (See Figure 3.) Notice also that more than one of every five rates in the sample involves contract terms individually negotiated with the customer. These are not truly rates at all in the traditional sense; rather, they are pricing concessions granted to specific large power users whose continued presence on the system has been judged vital to the interest of other native load customers.

The "Just and Reasonable" Standard in Transition

In short, the growth of customer alternatives during the 1980s has been rapidly dissolving the sanctity of embedded cost- based rates. The reason is that competition presents regulation with situations in which continued reliance on embedded cost rates can produce outcomes (e.g., lost jobs, stranded investment, rate shock for native load customers) that may not be in the public interest. Stated another way, under competition, embedded cost rates are sometimes not the most "just and reasonable" pricing alternative available.

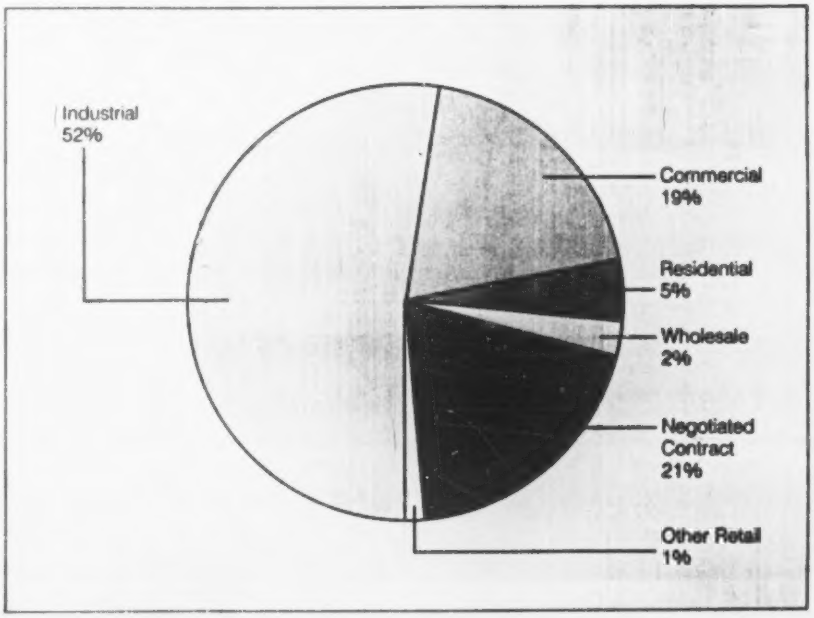
If traditional, embedded cost ratemaking is no longer always adequate to ensure that rates are just and reasonable, perhaps a new framework is needed for evaluating the public interest. In theory, "welfare economics" can provide such a framework. This branch of economics focuses on changes in aggregate consumer "utility", or welfare, as a way of evaluating alternative pricing (rate) options.

Welfare analysis shows that whether an innovative rate leads to greater consumer utility than a traditional embedded cost rate depends on the customer's price elasticity of demand. If the customer's demand for power is price elastic, a discounted (incentive) rate will induce a higher level of consumption than would the prevailing (embedded cost) rate. As a result, the electric company will realize incremental net revenues, *assuming that the discounted price is above the marginal cost of supply*. Public welfare will be increased if these incremental net revenues are used to offset revenue requirements, thereby lowering rates for other customers. (In most cases incremental net revenues are *shared* between shareholders and ratepayers in the interest of fairness.)

Emerging Criteria

Unfortunately, the price elasticities of customers' demands are seldom known with sufficient precision to support the kind of welfare analysis that is theoretically possible. In practice, regulation is evolving several

Distribution of Innovative Rates by Class



John Zoiner/Uniphoto

new criteria, or decision rules, to evaluate the justness and reasonableness of innovative rate proposals. These criteria generally are consistent with welfare analysis, but they are far easier to implement. They include the following:

1. "Free Rider" Defenses—To prevent undue price discrimination, innovative rate programs generally include mechanisms to prevent "free riders" (i.e., customers who would take service under prevailing rates, but who take advantage of discounts simply because they are available; in other words, customers whose demand is price inelastic). To prevent free rider abuse, commissions frequently allow utilities discretion to withhold incentive rates from all but those customers who, in the utility's judgment, would not take service without the discount. In some cases affidavits to this effect must be filed with the commission; in others the utility must document increases in usage, investment, and/or employment by customers taking advantage of the rates.

2. Rates Above Marginal Cost—Consistent with welfare economics theory, virtually all commissions require that innovative rates recover variable (short-run marginal) costs and make some contribution to fixed charge coverage. If this is accomplished, and if criterion 1 also is satisfied (so that the fixed charge contribution is truly incremental), it becomes much easier for a commission to find that an incentive rate is consistent with the just and reasonable standard.

3. No Cross-Class, Cross-Customer Subsidies—For an incentive rate to be fair (just), no other customer should pay more as a result of some customers' paying less. While criterion 1, to the extent it is achieved, means that rev-

To ensure that incentive rates do not hasten the need for new capacity, commissions usually require that they be available for a limited period of time.

enues realized under an incentive rate are truly incremental, commissions are very sensitive to the possibility that utilities may attempt to recover perceived revenue shortfalls from other customers and/or classes. In some jurisdictions, utilities must warrant that they will not seek to recover "lost" revenues from non-participating customers; in others the utility is required, for future ratemaking purposes, to calculate revenues from incentive customers at prevailing rates.

4. *Need for New Capacity*—A second critical aspect of the requirement that other customers pay no more as a result of an incentive rate is the concern that incentive rates, by giving price signals to consume, will stimulate the growth of on-peak demand, hastening the day when new capacity must be added—driving up rates for all customers. This concern generally translates into the requirement that incentive rates be available for a limited period (most often for a five-year period). Commissions also frequently require annual reports which allow them to monitor the growth of incremental loads stimulated by the incentive rate.

Conclusion

Leaving aside the politically-charged question of whether increased competition is ultimately in the electric customer's interest, there can be little doubt that competition is introducing new dimensions (and new burdens) into regulation's "just and reasonable" mission. Regulation is no longer simply protecting the public from monopoly pricing. It now operates in a hybrid regulated/market system, continuing to administer just and reasonable prices but finding its ability to set prices constrained by the growth of customer alternatives. In such an environment, justness and reasonableness take on new meaning, as regulation finds itself increasingly forced to mediate between the interests of large, market-empowered customers and remaining native load customers. To date, both utilities and commissions have shown themselves to be remarkably adaptive in evolving new criteria to achieve justness and reasonableness in a changing market environment. ■

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FINANCIAL REVIEW

WRITE-OFFS AND ACCRUALS REDUCE EARNINGS PER SHARE

Despite a 2.1 percent sales increase over the first quarter of 1988, investor-owned electric utility earnings per share (EPS) before extraordinary items decreased from $0.69 in the first quarter of 1988 to $0.61 in the first quarter of 1989, an 11.6 percent decline. The EPS decrease was due primarily to writeoffs and a lower level of income accruals and expense deferrals. When the effects of extraordinary items and the cumulative effect of accounting changes are taken into consideration, the first quarter 1989 EPS increased 25 percent over the first quarter of 1988. This increase occurred because of a significantly lower level of writeoffs charged to the cumulative effect of a change in accounting principle.

Writeoffs and accruals together represented a $712 million income reduction in the first quarter of 1989 compared to 1988. Writeoffs associated with plant-related disallowances reported by three companies amounted to $405 million in the first quarter of 1989. The writeoffs were recognized as other income and deductions on the EEI Income Statement. (See Table 1.) Phase-in plan accruals decreased $111 million and allowance for funds used during construction (AFUDC) decreased $196 million from their first quarter 1988 amounts.

Income Statement

Electric operating revenue increased 2.5 percent in the first quarter of 1989. Electric operating expenses increased 2.9 percent from $26.1 billion in the first quarter of 1988 to $26.8 billion in the first quarter of 1989. No particular expense account showed a significant increase.

The higher percentage increase in expenses compared to revenue led to only a 0.9 percent increase in electric operating income on a quarter to quarter basis. The industry's operating ratio increased slightly from 79.1 percent in the first quarter of 1988 to 79.5 percent for the same quarter of 1989.

Fuel and other operation and maintenance expense increased moderately by 1.7 percent and 2.2 percent respectively over last year's first quarter. Despite the small increase, fuel as a percentage of operating revenue was only 23.2 percent in the first quarter of 1989, the second lowest percentage since EEI began tabulating financial statement data on a quarterly basis (1977). Fuel did not increase as much as sales due to lower fossil fuel costs, increased low cost nuclear generation and improved hydro conditions.

The rate of increase for operation and maintenance expense has leveled off significantly. It was 11.1 percent in 1988 compared to 1987.

Depreciation increased slightly by 3.3 percent over the first quarter of last year. However, the $3.7 billion 1989 first quarter amount was approximately twice what was being recorded on a quarterly basis by the industry in 1983. The quarterly increase in depreciation was in part attributable to several nuclear units beginning operation over the past two years. The rate of increase in depreciation is at a lower level than the 1988 to 1987 rate of 10.6 percent.

Allowance for funds used during construction (AFUDC) dropped from $789 million in the first quarter of 1988 to $593 million in the first quarter of 1989, a 24.8 percent decrease. The decline contributed to an overall improvement in the quality of earnings for the industry but more than offset the earnings gain in electric operating income. The ratio of AFUDC as a percent of net income available for common decreased from 25.2 percent in the first quarter of 1988 to 15.0 percent in the first quarter of 1989.

Total phase-in accruals decreased from $584 million in the first quarter of last year to $473 million in the same quarter of 1989. Phase-in plan accruals declined to their lowest amount since EEI began tabulating them in the first quarter of 1987. Phase-in plan accruals as a percentage of net income available for common decreased from the 18.6 percent recorded in the first quarter of 1988 to 12.0 percent during the same period of 1989.

Other income and deductions decreased from $310 million in the 1988 first quarter to $38 million in the first quarter of 1989. This decline is one of the primary reasons for the decrease in EPS before extraordinary items and a cumulative change in accounting principle. The decrease was attributable primarily to plant writeoffs of three companies. Two companies incurred $355 million regulatory plant disallowances relating to new plant being brought into rate base. Another company wrote off $50 million relating to a contract settlement.

Plant writeoffs charged to the cumulative effect of a change in accounting principle were $26 million in the first quarter of 1989 compared to $1,703 million for the same quarter in 1988. Also listed under that line item were unbilled revenues of $11 million for the first quarter of 1989 and $364 million for the first quarter of 1988.

Other interest expense and charges increased 45.7 percent from $217 million in the first quarter of 1988 to $317 million in the third quarter of 1989.

Common dividends per share grew slightly from $1.94 a share for the year ending March 31, 1988, to $1.95 for the twelve months ending March 31, 1989. The dividend payout ratio (after extraordinary items) of 86.7 percent for the twelve month period ending March 31, 1989, was up from the 80.6 percent recorded for the same period one year earlier.

The return on average common equity (ROE) before extraordinary items was 10.2 percent for the twelve month period ending March 31, 1989, down from the 12.2 percent reported for the twelve months ending March 31, 1988. The change in ROE reflects lower earnings due to writeoffs and lower accruals.

Balance Sheet

In some cases, compliance with the Financial Accounting Standards Board's Statement of Financial Accounting Standards (SFAS) No.94, "Consolidation of All Majority-owned Subsidiaries", caused companies with significant non-utility, particularly finance-related, operations to show large increases in total assets over the previously reported year-ending December 31, 1988 amount. Total assets of the EEI investor-owned electric utilities sample increased by over $13.2 billion from December 31, 1988, to $477.7 billion, on March 31, 1989. (See Table 2.) Balance sheet amounts for the year-ending March 31, 1988, have been restated to retain comparability. Historical ratio trends may be somewhat distorted by the adoption of SFAS 94, which has led to an increase in investments, long-term debt, short-term debt, and other deferred credits.

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Table 1

Investor-Owned Electric Utility Industry Statement of Income
(Millions of Dollars)

	Three Months Ending March 31,			Twelve Months Ending March 31,		
	1989	1988r	% Change[3]	1989	1988r	% Change[3]
Total Electric Operating Revenues[1]	$33,759	$32,930	2.5	$136,496	$131,617	3.7
Electric Operating Expenses						
Fuel	$ 7,828	$ 7,701	1.7	$ 31,902	$ 31,334	1.8
Other Operation & Maintenance	10,708	10,483	2.2	43,411	40,195	8.0
Depreciation & Amortization	3,708	3,578	3.6	14,304	13,261	7.9
Costs Deferred Under Rate Phase-in Plans	(205)	(326)	(37.1)	(966)	(1,193)	(19.0)
Taxes Other Than Income Taxes	2,725	2,629	3.7	10,650	10,128	5.1
Income Taxes: Federal & Other	1,418	1,362	4.2	6,198	6,452	(3.9)
Deferred Income Taxes	666	680	(2.1)	2,524	3,418	(26.2)
Investment Tax Credits, Net	(25)	(48)	(47.8)	(272)	296	N.M.
Total Electric Operating Expenses	$26,824	$26,058	2.9	$107,751	$103,891	3.7
Electric Operating Income	$ 6,935	$ 6,872	0.9	$ 28,744	$ 27,727	3.7
Other Utility Operating Income	723	723	0.1	1,261	1,214	3.9
Total Utility Operating Income	$ 7,659	$ 7,595	0.8	$ 30,006	$ 28,941	3.7
Other Income & Deductions—Net	38	310	(87.7)	(789)	965	N.M.
Phase-in Deferrals	268	258	3.9	1,017	1,018	(0.2)
Allowance for Other Funds Used During Construction	292	418	(30.3)	1,426	2,464	(42.1)
Total Income Before Interest Charges	$8,256	$8,580	(3.8)	$ 31,659	$ 33,388	(5.2)
Interest Charges						
Interest on Long-Term Debt	$ 3,746	$ 3,709	1.0	$ 14,921	$ 14,813	0.7
Other Interest Expenses & Charges	317	217	45.7	1,192	822	45.0
Allowance for Borrowed Funds Used During Construction	(302)	(371)	(18.7)	(1,368)	(1,802)	(24.1)
Net Interest Expenses & Charges	$ 3,761	$ 3,555	5.8	$ 14,745	$ 13,833	6.6
Net Income Before Extraordinary Items	$ 4,495	$ 5,025	(10.6)	$ 16,914	$ 19,555	(13.5)
Extraordinary Items	9	0	N.M.	(57)	54	N.M.
Cumulative Effect of a change in accounting principle[4]	(19)	(1,338)	N.M.	(19)	(1,737)	N.M.
Net Income	$ 4,485	$ 3,687	21.6	$ 16,838	$ 17,873	(5.8)
Preferred Dividends Declared	533	554	(3.7)	2,168	2,338	(7.3)
Net Income Available for Common	$ 3,952	$ 3,133	26.1	$ 14,670	$ 15,534	(5.6)
Common Dividends Declared	3,102	3,055	1.5	12,717	12,523	1.5
Additions to Retained Earnings	$ 850	$ 78	991.9	$ 1,954	$ 3,011	(35.1)
Average Shares Outstanding (Millions)[2]	6,539	6,484	0.8	6,520	6,468	0.8
Earnings Per Share Before Extraordinary Items and the Cumulative Effect of a change in accounting principle[2]	$ 0.61	$ 0.69	(11.6)	$ 2.26	$ 2.66	(15.0)
Earnings Per Share After Extraordinary Items and the Cumulative Effect of a change in accounting principle[2]	$ 0.60	$ 0.48	25.0	$ 2.25	$ 2.40	(6.2)
Common Dividends Per Share[2]	$ 0.47	$ 0.47	0.0	$ 1.95	$ 1.94	0.5

SOURCE: EEI Survey Data and Standard and Poors Compustat II Database Service
NOTE:

[1] Revenues are adjusted for intra-industry sales for resale of electricity.
[2] Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.
[3] Percent changes may reflect roundings.
[4] Total reflect 1988 and 1987 first, second, and third quarter data only.
r—Revised to reflect company restatements.
N.M.—Not Meaningful.

Table 2
Investor-Owned Electric Utility Industry Balance Sheet
(Millions of Dollars)

Assets	**March 31, 1989**	**March 31, 1988r**	**Percent Change[3]**
Utility Plant[1]			
Utility Plant (Including Nuclear Fuel)	$464,909	$450,135	3.3
Less Accumulated Depreciation	134,129	123,180	8.9
Total	$330,781	$326,955	1.2
Construction Work in Progress	41,557	44,236	(6.1)
Net Utility Plant	$372,338	$371,192	0.3
Investments	32,489	23,805	36.5
Current Assets	40,797	41,454	(1.6)
Deferred Debits	32,054	29,178	9.9
Total Assets	$477,678	$465,628	2.6
Capitalization & Liabilities			
Capitalization			
Common Stock	$ 93,537	$ 93,107	0.5
Retained Earnings	52,214	51,324	1.7
Preferred Stock	26,606	27,909	(4.7)
Long-Term Debt	168,559	163,537	3.1
Total Capitalization	$340,916	$335,877	1.5
Current Liabilities			
Short-Term Debt	$ 10,544	$ 7,966	32.4
Long-Term Debt Due Currently	5,791	5,546	4.4
Other Current Liabilities	31,308	31,483	(0.6)
Total Current Liabilities	$ 47,643	$ 44,995	(5.9)
Deferred Credits			
Capital Lease Obligations, Non-Current Portion	$ 4,982	$ 4,680	6.5
Accumulated Deferred Income Taxes[2]	47,915	43,616	9.9
Accumulated Deferred Investment Tax Credits	16,551	17,365	(4.7)
Other Deferred Credits	19,672	19,094	3.0
Total Deferred Credits	$ 89,119	$ 84,756	5.1
Total Capitalization & Liabilities	$477,678	$465,628	2.6

SOURCE: EEI Survey Data and Standard and Poors Compustat II Database Service

[1] Includes non-electric utility plant.

[2] Includes property-related deferred income taxes.

[3] Percent changes may reflect roundings.

r—Revised.

The industry's balance sheet continues to improve as construction work in progress (CWIP) decreased from $44.2 billion as of March 31, 1988, to $41.6 billion as of March 31, 1989. CWIP as a percentage of net plant in service dropped from 13.5 percent to 12.6 percent during the same period. Associated with the decrease in CWIP were increases in total utility plant of 3.3 percent and accumulated depreciation and amortization of 8.9 percent. The percentage changes for these items, which make up net utility plant, are lower than they have been for many quarters and reflect the continuing reduced level of new generating plant construction.

Investments for the industry as of March 31, 1989, showed an increase of 36.5 percent to $32.5 billion, up from the $23.8 billion recorded March 31, 1988. The increase represents the inclusion of the assets of subsidiary operations of holding companies, such as banking and insurance, brought on by accounting changes caused by SFAS 94.

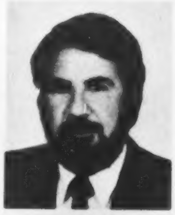
Total capitalization for the first quarter of 1989 rose 1.5 percent, representing an increase of $5.0 billion over the year ending March 31, 1988. The increase was primarily a result of the 3.1 percent increase in long-term debt from $163.5 billion to $168.6 billion. Long-term debt rose from 48.7 percent of capitalization for year ending March 31, 1988, to 49.4 percent for year ending March 31, 1989. While long-term debt increased substantially, the common equity ratio decreased from 43.0 percent recorded March 31, 1988, to 42.8 percent as of March 31, 1989. Despite decreasing as a part of total capitalization, total common equity grew slightly from $144.4 billion at March 31, 1988, to $145.8 billion at March 31, 1989, a 1.0 percent increase. The slight percentage growth of retained earnings and common stock reflect the effects of writeoffs and common stock buyback programs, respectively. The increase of the industry's total capitalization was offset by the retiring of preferred stock. As a percentage of total capitalization, preferred stock decreased from the 8.3 percent recorded as of March 31, 1988, to 7.8 percent as of March 31, 1989.

Short-term debt showed a 32.4 percent increase of $2,578 million as of twelve months ending March 31, 1989, over the $7,966 million recorded for March 31, 1989. This increase is also attributable to the consolidation of finance-type subsidiaries in the balance sheet.

Tables 1 and 2 are based on unaudited reports submitted by a sample of investor-owned electric utilities. The sample represents approximately 98.1 percent of the investor-owned electric utility industry's total assets and 97.2 percent of its total revenues. The data are adjusted to represent the entire investor-owned electric utility industry by using the Standard & Poor's Utility Compustat II database. The prior-year data also have been revised to reflect all company restatements.

Contributed by Edison Electric Institute's Finance and Accounting Department.

MANAGING CHANGE



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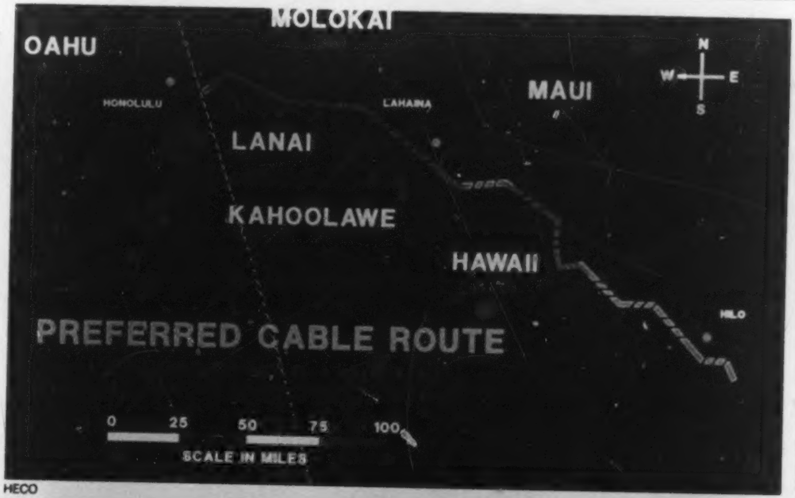
TECHNOLOGY REVIEW

HECO PLANS INNOVATIVE G&T PROJECT



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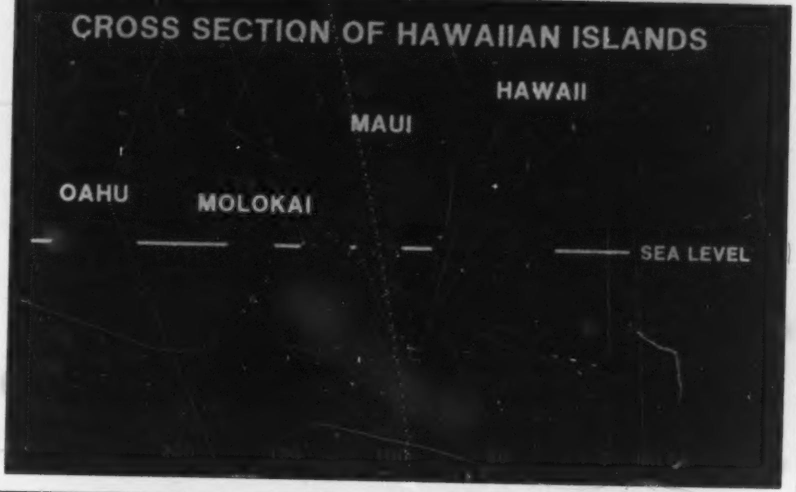

The State of Hawaii and Hawaiian Electric Company (HECO) have sent requests for proposals (RFPs) to 31 prospective geothermal developers to undertake the development of one of the world's most innovative electrical generation and transmission projects.

The goal is to develop 500 megawatts of electricity from geothermal energy on the island of Hawaii and transmit it by underwater cable to other islands in the state, primarily to heavily populated Oahu, a distance of about 270 miles.

Successful completion of the project would satisfy a major portion of Oahu's electrical demand with geothermal energy and reduce annual oil imports to the island state by millions of barrels. Oahu accounts for about 80 percent of the state's electrical consumption.

An open proposer's conference was held June 5. The project calls for a private consortium to finance and develop the geothermal energy resource on the island of Hawaii and transmit electricity from the resource by underwater cable to Oahu, and possibly Maui as well.

Selection of the developer of the project, which is expected to cost in excess of $1.7 billion, is expected to be made by the end of 1990.

Driven by near-total dependence on oil imports for its energy, Hawaii has included increased energy self-sufficiency as an objective of the Hawaii State Plan.

"Hawaii's energy outlook requires positive action now," said Governor John Waihee. "We are fortunate to have our own natural resource for electricity on a commercial scale around the clock. Development of geothermal energy is the key to achieving state goals of energy self-sufficiency."

HECO President Harwood D. Williamson said geothermal energy has long been seen by his company as Hawaii's best renewable energy alternative to fuel oil to generate electricity.

"Without question, geothermal energy is the best near-term renewable energy alternative to meet the base-load needs of our utilities in satisfying our customers' needs," Williamson said. "Successful completion of this project would be a significant contribution to making Hawaii more secure and less vulnerable to the uncertainties of the world oil market."

Although geothermal energy could not be transmitted to Oahu until around 1995, issuing an RFP in 1989 allows HECO time to consider other alternatives if the response to the RFP shows that economical geothermal electricity will not be available by then.

Much of the United States began converting from oil to other fuels for electrical generation in the 1970s in reaction to the OPEC oil embargo, but Hawaii's mid-Pacific isolation has prolonged the state's near-total dependence on fuel oil. Hawaii uses fuel oil to generate more than 90 percent of its electricity.

The geothermal energy resource on the island of Hawaii, the "Big Island," has been estimated to be at least 500 megawatts, far more than can be utilized on that island. Hawaii Electric Light Company, HECO's electric utility subsidiary that serves the Big Island, had a peak demand in 1988 of approximately 126 megawatts.

A small State-owned research and demonstration geothermal power plant on Hawaii has supplied approximately 2 megawatts, enough to service approximately 2,000 homes, to Hawaii Electric Light Company since 1982.

The RFP calls for development of the existing Geothermal Resource Subzones in the Kilauea East Rift Zone of the Big Island's Puna District, where the demonstration plant is located. This subzone is believed to have the largest geothermal resource in the island chain.

Early in 1988, the Governor's Advisory Committee on the Geothermal/Cable project, chaired by former Hawaii Governor William F. Quinn, endorsed geothermal energy as technically feasible in Hawaii. The State Legislature at about the same time consolidated and streamlined geothermal permitting procedures and funded geothermal exploration and reservoir analysis.

The export of large amount of electricity from the Big Island to Oahu has been studied for years as the best way to reduce the state's dependence on fuel oil.

Since 1982, HECO has been the prime contractor of the Hawaii Deep Water Cable Project, which is funded jointly by the U.S. Department of Energy and the State Department of Business and Economic Development.

A 6,000-foot electric cable of a type that could be deployed between the islands was manufactured in 1987. Laboratory testing of the cable has been completed, finding that the cable is mechanically and electrically sound.

At-sea testing of deployment and retrieval procedures using a surrogate, non-electric cable, will begin during the last three months of 1989 in the Alenuihaha Channel between the islands of Hawaii and Maui.

The Hawaii deep water cable will be the longest and deepest electrical power cable in the world. The deepest portion of the cable route between the Big Island and Oahu would be approximately 7,000 feet, in the Alenuihaha Channel. ■

Contributed by Hawaiian Electric Company.

REGULATORY REVIEW

OTA REPORT ON "ELECTRIC POWER WHEELING AND DEALING" RELEASED

The Office of Technology Assessment (OTA) released its report on the technological aspects of increased competition and transmission access in the electric power industry at a May 24 hearing before the House Energy and Power Subcommittee. The report culminates a two-year effort that OTA initiated in May 1987 at the request of members of Congress.

The report, entitled "Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition", explored the technical requirements for introducing greater competition into the operation and planning of the electric power industry, with particular emphasis on reliability and operation of the transmission network. The report considered two major mechanisms: (1) competition among generators to supply electric power; and (2) expanding access to the transmission network for wheeling bulk power from seller to buyer.

OTA concluded that "competitive generation can be introduced without providing access to transmission, but it is likely that any significant move toward competition would probably include some degree of both." It stated that expanded access to the transmission system would increase competition, and that competitive generation and transmission access can be combined. However, the report stressed that "whatever form increased competition takes will have significant implications for customers, utilities and new players alike."

The study did not identify any specific reason why competition cannot be made to work, but cautioned that "insufficient analysis has been done to determine whether benefits outweigh costs," that "there are ways of implementing competition that would work very poorly, [and that] there are many pitfalls that must be avoided."

Alan Crane, Senior Associate with OTA, told the subcommittee that while "alternative approaches to the existing regulatory and institutional structure have been proposed . . . there is no consensus on which changes are appropriate." He noted that "OTA identified no insurmountable problems of technical feasibility for any of the proposals; substantial uncertainties exist, and problems and issues will arise, but the solutions will be much less technical than political and institutional."

Ron Bowman/Uniphoto

However, Crane cautioned that "any form of competition must be introduced carefully or costs could rise and reliability degrade[d]." He further indicated that "[c]osts, benefits, and impacts of competition are uncertain and largely speculative."

Richard Disbrow, President of American Electric Power Company, testified on behalf of Edison Electric Institute. While stating that he did not necessarily agree with all of the conclusions of the study, Disbrow, who served on the advisory committee that guided the OTA effort, commended OTA for "clearly present[ing] a balanced look at the current uncertainty regarding the costs and benefits of increased . . . competition." He also noted that "the [report's] conclusions verify many of the concerns . . . expressed by EEI and its members regarding the potential detrimental impacts of revolutionary changes in the structure and regulation of the electric utility industry."

The OTA report recognized that current interutility transactions benefit all parties and encourage efficient operation. The report noted that the bulk power system must be operated as a coordinated system and that the industry has developed a high level of cooperation among both private companies and government agencies. OTA noted that utilities already expend considerable effort implementing economic dispatch, and that every flow of power from a plant to the distribution network affects the entire transmission system. The report considered the constraints of the power system and noted that technical advances will be necessary to expand it significantly.

"The greatest challenge to increasing competition in generation and expanding transmission access is maintaining the high degree of coordinated planning and operating among bulk power system components," said OTA. "If coordination is not properly addressed, the system may experience increasing costs and decreasing reliability."

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STATISTICAL REVIEW

ELECTRIC OUTPUT UP 2.9 PERCENT FOR FIRST SIX MONTHS

The cumulative weekly electric output for the first six months of 1989 increased 2.9 percent over the same period of 1988. The greatest increases occurred in the New England and Pacific Southwest divisions, which rose by 9.5 percent and 8.6 percent respectively. The only divisional decrease occurred in the Southeast division, whose year-to-date output fell by 1.4 percent.

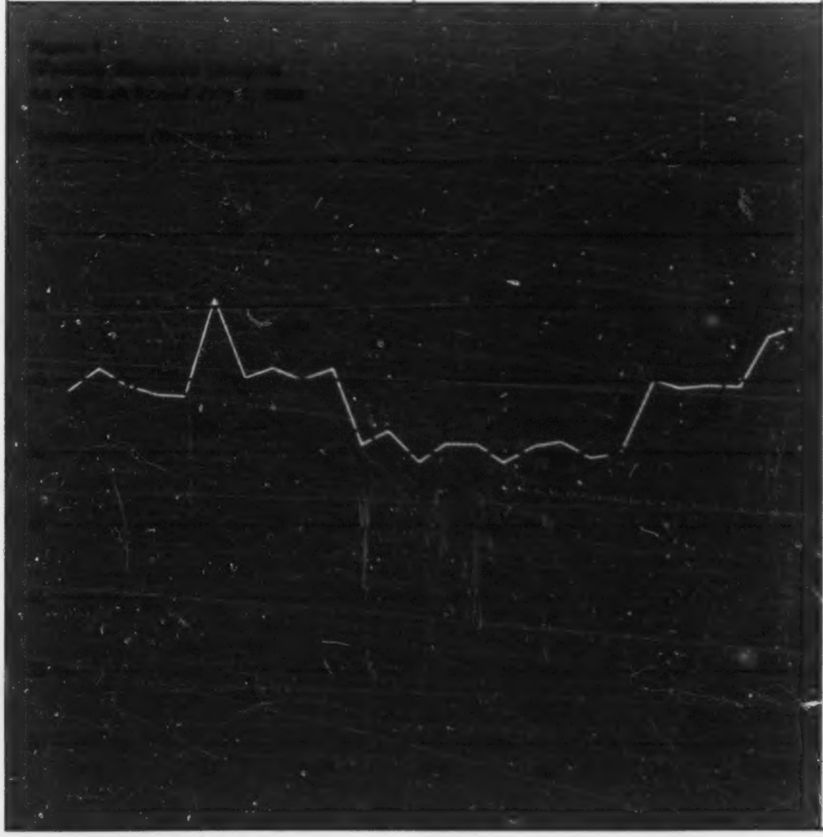
The electric output for each of the first twenty-six weeks of 1989 were higher than those of 1988 in all but six weeks. Three of these weeks occurred in January and can be attributed to the colder temperatures that much of the nation experienced during the winter of 1988. The heating degree days for this past January were 23 percent less than those for January of 1988.

The 1989 output also decreased from 1988 in the last two weeks of June. These decreases were the result of the early summer heat wave in 1988. For the week ended June 24, 1989, the weekly output was 5.3 percent less than that of the corresponding week of 1988, when the first of three record highs for 1988 was recorded.

The highest weekly output in the first six months of 1989 was for the week ended February 11. The total recorded output was 60,378 gigawatthours (GWH). This was 7.1 percent higher than the corresponding week of 1988. The largest increases occurred in the Pacific Northwest and Rocky Mountain divisions, with increases of 31.3 percent and 16.3 percent, respectively.

In the first quarter of 1989, sales to ultimate customers by the total electric utility industry rose by 2.1 percent over the first quarter of 1988. This is reflected in the year-to-date electric output for the week ended March 25, 1989, which showed an increase of 2.3 percent over the same period in 1988. In the second quarter of 1989, the cumulative weekly output was up by 3.4 percent. Therefore, second quarter sales, which will be published in September, are likely to increase between 3.2 percent and 3.4 percent over the second quarter of 1988.

Contributed by Edison Electric Institute's Statistics Department.



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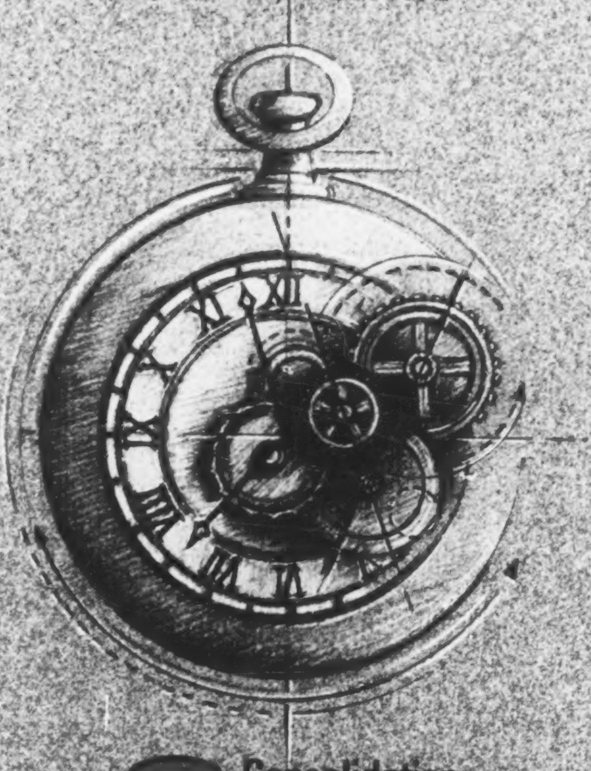

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